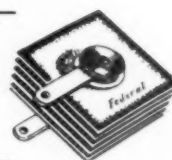
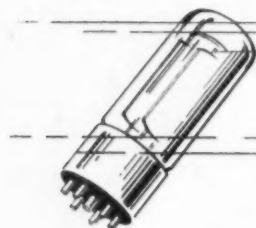


RADIO NEWS

JANUARY
1948

RADIO-ELECTRONIC
ENGINEERING
EDITION

SEALING ELECTRON GUN ASSEMBLY OF 6-15 CM. KLYSTRON.



STORY WITHOUT WORDS

...here's how it can boost your profits

AS SURELY AS the "gasoline buggy" replaced the horse-drawn carriage, the Miniature Selenium Rectifier—an original Federal development—is destined to take the place of the rectifier tube in AC-DC receivers. Already, more and more manufacturers are building it into their radio sets—and more and more maintenance shops are installing it in the sets they service.

What about you? Here is really a big chance for you to

make extra money—by modernizing AC-DC sets now using a rectifier tube—giving them faster starting, better all-around performance. And as new sets using the Miniature Rectifier as original equipment come to you for servicing, you'll want to be ready with replacements. It's your opportunity to be a leader by introducing this improvement now—by installing Federal's Miniature Selenium Rectifier in every AC-DC receiver you service.

Available through major jobbers from coast to coast—complete with detailed instructions.



KEEPING FEDERAL YEARS AHEAD... is IT&T's world-wide research and engineering organization, of which the Federal Telecommunication Laboratories, Nutley, N. J., is a unit.

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Engin
Fallon

A FREE LESSON SHOWED BILL HOW HE COULD MAKE GOOD PAY IN RADIO!

BILL, YOU'RE ALWAYS FOOLING
WITH RADIO--OUR SET WON'T
WORK--WILL YOU FIX IT?

I'LL TRY, MARY. I'LL
SEE WHAT I CAN DO
WITH IT TONIGHT



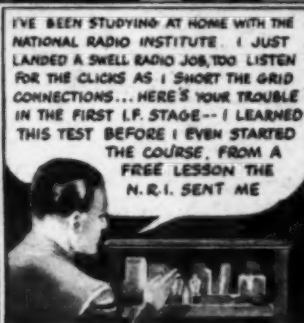
I CAN'T FIND OUT
WHAT'S WRONG --
GUESS I'LL MAKE A
FOOL OF MYSELF
WITH MARY

HELLO, BILL -- GOT
A TOUGH ONE
TO FIX?
LET ME
HELP YOU

YES, JOE -- I'M
STUMPED -- BUT
SINCE WHEN ARE
YOU A RADIO EXPERT?

I'VE BEEN STUDYING AT HOME WITH THE
NATIONAL RADIO INSTITUTE. I JUST
LANDED A SWELL RADIO JOB, TOO. LISTEN
FOR THE CLICKS AS I SHOW THE GRID
CONNECTIONS... HERE'S YOUR TROUBLE
IN THE FIRST I.F. STAGE -- I LEARNED
THIS TEST BEFORE I EVEN STARTED
THE COURSE, FROM A
FREE LESSON THE
N.R.I. SENT ME

SAY, I'VE SEEN THEIR
ADS BUT I NEVER THOUGHT
I COULD LEARN RADIO
AT HOME
I'LL MAIL
A COUPON
FOR A FREE
LESSON RIGHT
AWAY



I'M CONVINCED NOW
THAT THE N.R.I. COURSE
IS PRACTICAL AND
THOROUGH. I'LL
ENROLL NOW. THEN
I CAN MAKE EXTRA
MONEY FIXING
RADIOS IN SPARE
TIME WHILE
LEARNING

SOON I CAN HAVE MY
OWN FULL-TIME RADIO
REPAIR BUSINESS, OR BE
READY FOR A GOOD JOB
IN A BROADCASTING STATION
AVIATION RADIO, POLICE
RADIO OR SOME
OTHER BUSY
RADIO FIELD

YOU CERTAINLY KNOW
RADIO. SOUNDS AS
GOOD AS THE DAY
I BOUGHT IT!

THANKS! I WAS JUST
A TINKERER, A FEW
MONTHS AGO, BEFORE
I STARTED THE N.R.I.
COURSE -- BUT
N.R.I.'S "50-50
METHOD" GIVES A
FELLOW THE PRACTICAL
KNOWLEDGE AND EXPERIENCE
TO BE A SUCCESSFUL
RADIO TECHNICIAN

OH, BILL -- I'M SO GLAD
I ASKED YOU TO FIX
OUR RADIO! IT GOT
YOU STARTED THINKING
ABOUT RADIO AS A
CAREER, AND NOW
YOU'RE GOING AHEAD
SO FAST!

YES, OUR WORRIES
ARE OVER I HAVE
A GOOD JOB AND
THERE'S A BRIGHT
FUTURE FOR US
IN RADIO



I will send you a Lesson on Radio Servicing Tips **FREE**

TO SHOW HOW PRACTICAL IT IS
TO TRAIN AT HOME FOR

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I want to give you a copy of my Lesson, "Getting Acquainted with Receiver Servicing" -- absolutely FREE! And with it, I'll send my 64-page illustrated book, "How to Be a Success in Radio," also FREE. It describes many fascinating Radio jobs, tells how N.R.I. trains you at home in spare time, how you get practical experience with BIG KITS OF RADIO PARTS I send. MAIL THE COUPON!

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The day you enroll I start sending EXTRA MONEY manuals. You LEARN Radio Principles from my easy-to-understand, illustrated lessons -- PRACTICE what you learn by building, testing and experimenting with parts I

send -- USE your knowledge to make EXTRA money fixing neighbors' Radios in spare time while still learning! From here it's a short step to your own full-time Radio Shop or a good Radio job!

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Study Radio School, Washington 9, D. C.

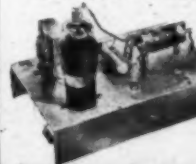
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MEASURING INSTRUMENT (above)
you build early in Course. Use it in practical Radio work to make EXTRA money. Vacuum tube multimeter, measures A.C., D.C., and R.F. volts, D.C. currents, resistance, receiver output.



SUPERHETERODYNE
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A. M. SIGNAL-GENERATOR (left) build it yourself! Provides amplitude - modulated signals for test and experimental purposes. Gives valuable practice!



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COVER PHOTO: Spot welding parts for fine reflex klystrons in the research laboratories of Sylvania Electric Products Inc. at Flushing, New York. The tube measures only 3 inches over-all and is designed for 6- and 18 centimeter applications. (Photo by Walter Steinhard)

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RADIO NEWS

"THE hottest ham performance ever at this price . . ." That's the verdict of amateurs who have had a chance to try Hallicrafters new Model SX-43.

This new member of the Hallicrafters line offers continuous coverage from 540 kilocycles to 55 megacycles and has an additional band from 88 to 108 megacycles. AM reception is provided on all bands, except band 6, CW on the four lower bands and FM on frequencies above 44 megacycles. In the band of 44 to 55 Mc., wide band FM or narrow band AM just right for narrow band FM reception is provided.

One stage of high gain tuned RF and a type 7F8 dual triode converter assure an exceptionally good signal-to-noise ratio. Image ratio on the AM channel on band 5 (44 to 55 Mc.) is excellent as the receiver is used as a double superheterodyne. The new Hallicrafters dual IF transformers provide a 455 kilocycle IF channel for operating frequencies below 44 megacycles and a 10.7 megacycle IF channel for the VHF bands. Two IF stages are used on the four lower bands and a third stage is added above 44 megacycles. Switching of IF frequencies is automatic. The separate electrical bandspread dial is calibrated for the amateur 3.5, 7, 14, and 28 megacycle bands.

Every important feature for excellent communications receiver performance is included.

Model **SX-43**

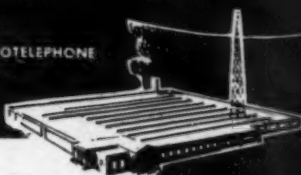


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5	D13-133	500,000 ohms	A
1	D13-133X	500,000 ohms	B
1	D13-137	1.0 meg.	A
1	D13-137X	1.0 meg.	B
1	D13-139	2.0 meg.	A

Purpose: A-Tone or Audio Circuit control;
B-Tapped for tone compensation.

SWITCHES

3	#41	S.P.S.T.
1	#42	D.P.S.T.

SHAFTS

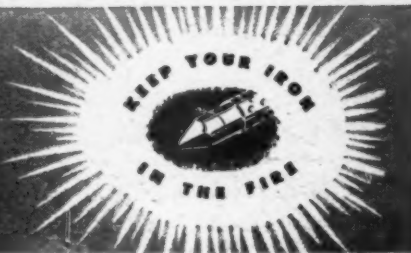
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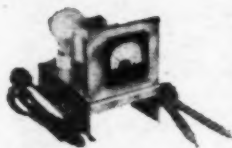
Whichever the Circuit may be



RADIO NEWS

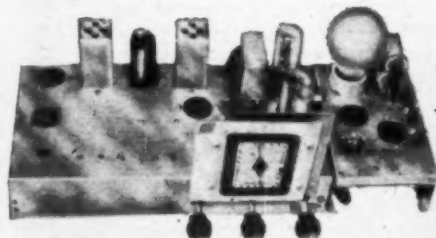
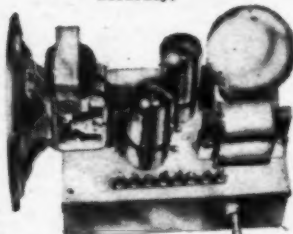
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For the RECORD.

• BY THE EDITOR

NEVER in the history of radio and electronics has the outlook for qualified technicians been brighter than now as we usher in a New Year. Lush markets are developing in TV, FM, magnetic recording and, in the not too distant future will come the long heralded Citizens' Radio Communications Service. Long "just around the corner," television has become a permanent fixture in thousands of American homes. We predict that close to a million TV sets will be in operation by the end of 1948.

Television has long been held back by the high cost of production and lack of enthusiasm on the part of prospective purchasers who did have the wherewithal to buy high priced equipment. With the advent of medium priced TV receivers, production is growing by leaps and bounds so that Mr. and Mrs. Average American will soon be purchasing television sets on an equal basis with console radios. Our entire concept of entertainment will change, just as it did when radio came into its own.

But television is not a plaything and cannot be serviced properly by the untrained. It takes technical "know how" to do the job intelligently and it also requires special test equipment and techniques not applicable to radio servicing.

We visited many service shops during 1947 and found few men capable of handling TV installations or maintenance. Those who were qualified had received proper training at some well established television institute. In addition, they had augmented their training by keeping abreast of television developments in technical journals. These technicians are the ones who will survive competition as television mushrooms throughout the country—not the diehards that fumble their opportunities by neglecting to study the intricacies of TV and other high frequency equipment and prepare themselves for this "new era" in radio and electronics.

Frequency modulation has deeply rooted itself as a hardy offspring of radio. We see a tremendous future demand for replacement tubes and service for FM receivers. No longer will satisfactory reception be limited to evening hours. Actual listening time will be greatly increased with the result that FM sets will be in operation for longer periods of time each day. This means an increase in

service and sales, as well as special antenna installations. The average FM receiver uses far more tubes than the average radio set, in addition to more parts and circuits which are more critical to maintain. Here again we find a real need for technicians familiar with high frequency systems. We've seen few servicemen who were able to do a thorough alignment job on FM units.

And what about magnetic recording—now established as a highly practical medium of entertainment for the masses. This comparative newcomer to radio-electronics is just getting its wings. Fidelity and mechanical requirements have been satisfactorily met. The great potential industrial market awaits practical magnetic recording for a host of special applications other than for entertainment. Here's another golden opportunity for wide-awake technicians to advance through service and sales. The sale of magnetic wire and tape and accessory items will become a lucrative business for radio dealers and servicemen.

So important is this new art that RADIO NEWS has prepared several timely articles on various phases of wire and tape recording for our next issue. We'll have some real scoops for you in the design of recording heads and other data that will enable you to experiment with magnetic recording in your own homes and radio shops.

Serious study and application today is necessary to insure individual success in the future presented by radio-electronics and television. We have pointed to this necessity on many occasions but it bears repetition time and again.

Our government too is fully cognizant of the growing and vital need for qualified technicians who are specializing in some field of radio-electronics. Progressive nations do all that they can to encourage the training of scientists and technicians. This brain power is one of the most potent defensive weapons we can possess. Therefore, progress in the fields of radio, electronics, television, etc. in peacetime can give us the necessary experience and training so essential to our security.

Yes, 1948 can well be the most progressive and prosperous year in the entire history of electronic development and all of us have a stake in its future. O. R.



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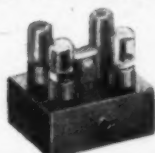
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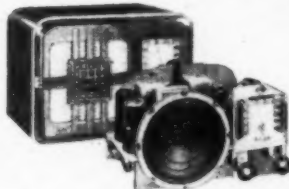
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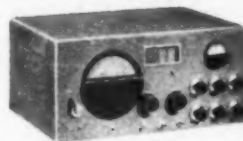
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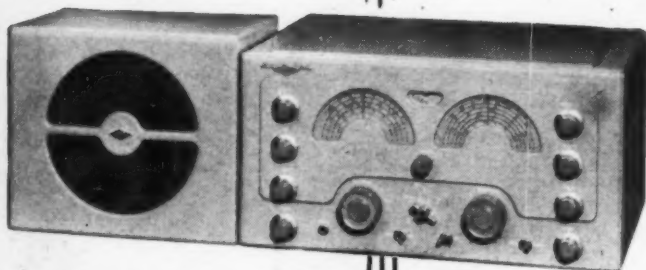
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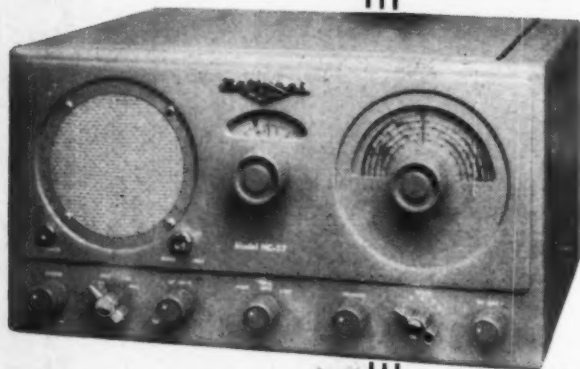
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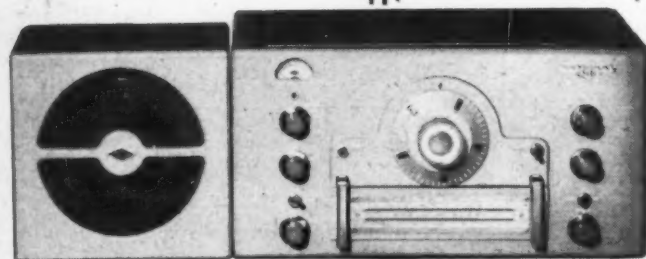


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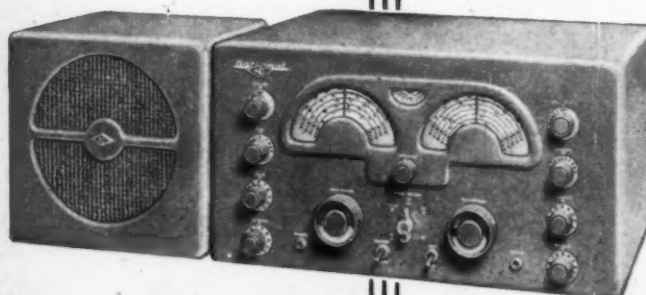


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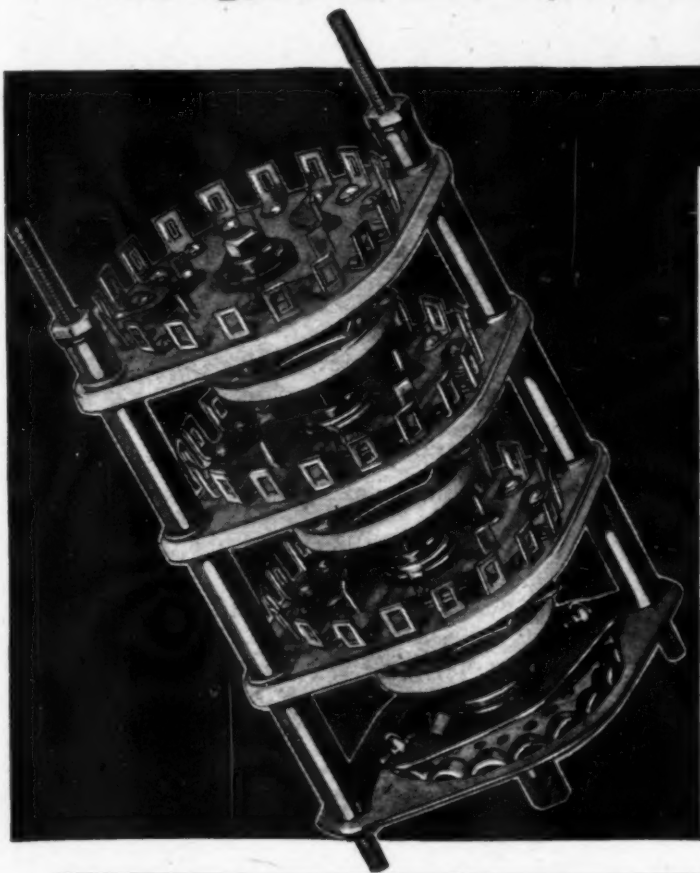
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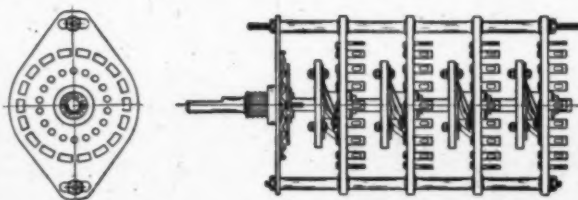
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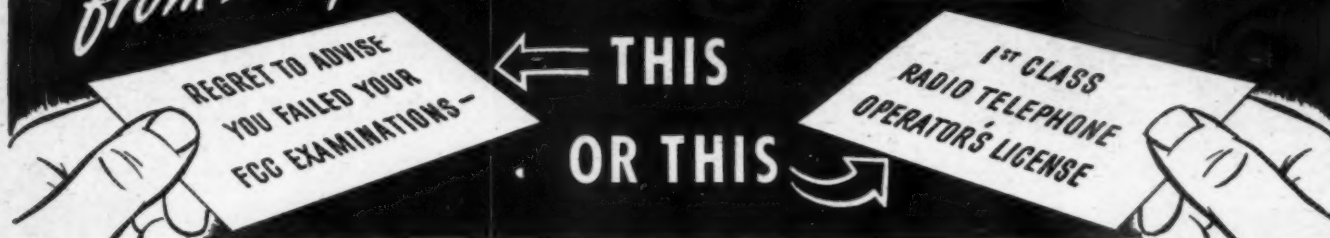
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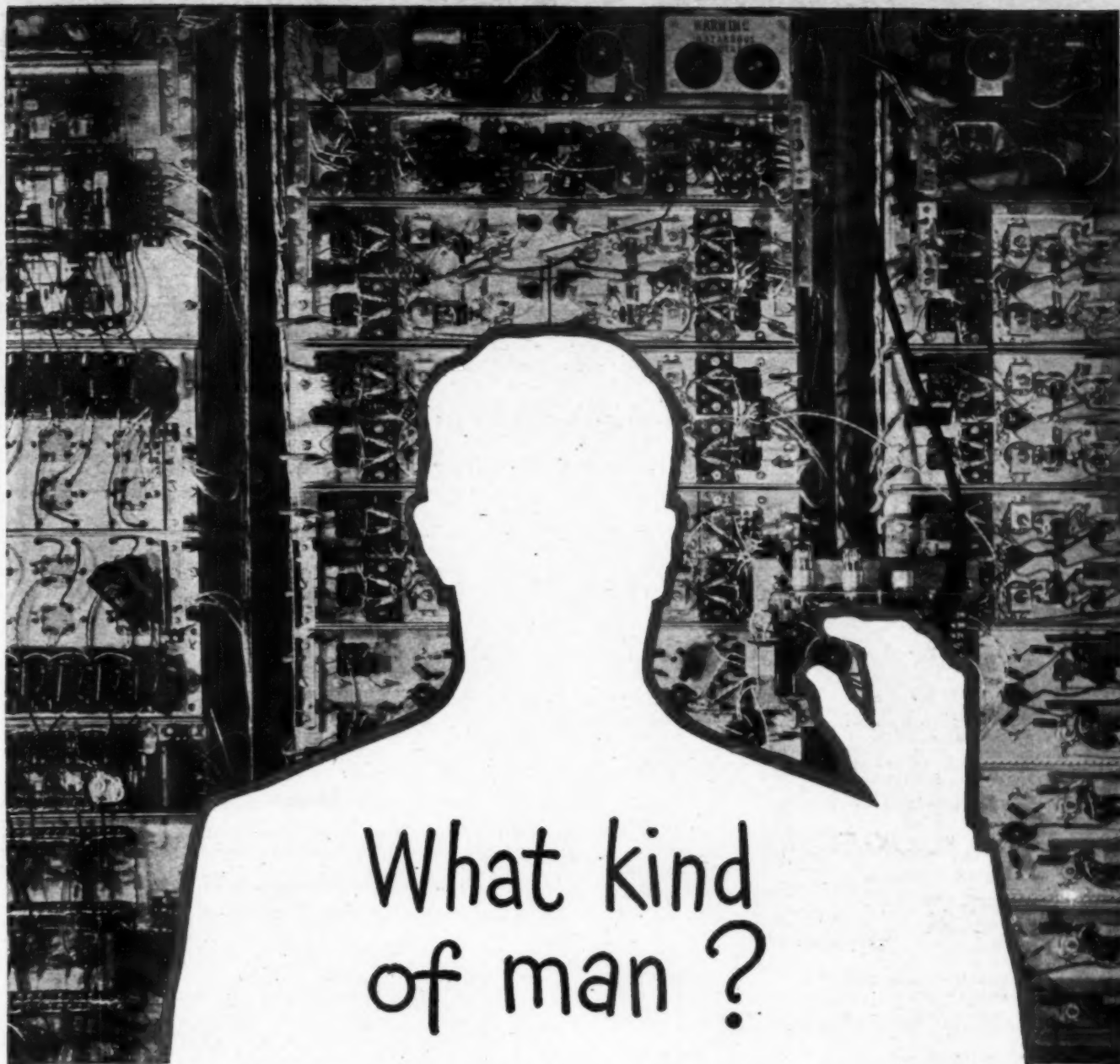
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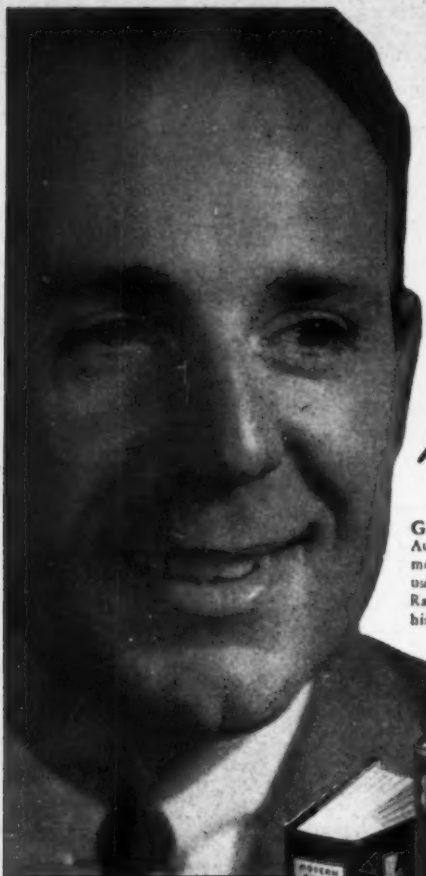


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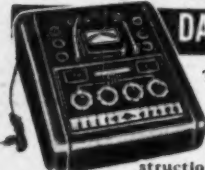
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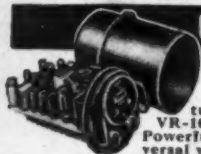
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Spot Radio News

★ Presenting latest information on the Radio Industry.

By **FRED HAMLIN**
Washington Editor, RADIO NEWS

SANTA CLAUS, according to reports, was nicest this year to frequency modulation. And on the basis of FM's year-end good luck, it looks as if it is going to have an even better 1948 than was reported in these columns last month.

AS THIS WENT to press, indications are that FM will come up to the new year with a number of excellent factors in its favor, according to Everett L. Dillard, president of the FM Association. Some of these factors made themselves known during 1947—still a banner year despite set-backs in the minds of FM experts. Others are already seen distinctly for '48.

BAD PRODUCTION luck slowed FM activities during the early months of '47. Mr. Dillard points out, but the production wheels were spinning full tilt before the end of the year. This meant three things. FM receiver production reached a new high of a million and FM tuners increased the number of potential listeners. FM production of station equipment broke that bottleneck, although not soon enough to influence appreciably the total number of stations on the air at year's end—some 325, as contrasted with the estimated 700 predicted by the Federal Communications Commission last spring. And third, FM's future, as a result of these things, seemed fast-moving and bright for the coming year.

MR. DILLARD IS particularly happy about this. He says that, with year-end set production going at an all-time high in the FM field, possibilities are that production will reach some seven million sets in 1948. It should reach a peak schedule along about February-March. The FCC prediction of 700 stations should come true about March 1. "Everything included," he says, "next year should see FM offering 100 percent coverage of metropolitan markets and, with good programming still a stressed feature, should see the beginning of its use as a mass advertising media."

WHILE WE'RE ON THE SUBJECT, one department where radio history will be made in the FM field in '48 will be networks. Mr. Dillard, who is also president of the FM Continental network, reports that it is progressing very well, indeed, with 28

stations on the string at last counting, and some 90 applicants heard from. The stations are hooked up with nearly six hundred miles of wire line and—more significant—1400 miles of radio relay. Continental did its first commercial broadcast beginning September 12, a half hour program sponsored by Stromberg-Carlson. More are in the offing. Inspired by Continental's lead, other networks are beyond the rumor stage in the North and South Carolina area, in Missouri-Kansas, and in Wisconsin-Indiana-Michigan. The Michigan network, with headquarters at Ann Arbor, was particularly successful this fall broadcasting football games. It may be anticipated that little networks will tie in with each other to forward national FM hook-ups.

FROM THE LOOKS OF THINGS, everybody is surveying the FM network field with eager eyes. Latest to be heard from is an organization called "Rural Radio Network, Inc.," organized to serve upstate New York farm areas. The group has received a conditional grant from FCC for six new FM stations—the maximum number of FM's that can be operated by the same interest. Stations will be located at Newfield, De Ruyter, Cherry Valley, Highmarket, South Bristol, and Wethersfield. Far from being local stations with a few network programs, Rural Radio proposes to do just the opposite—all stations will carry the same programs. Each station will furnish part of the daily program, and others will pick it up. Programs will be designed for farmer audiences, featuring weather and market reports, religion, music, agricultural talks, quizzes, children's material. Rural Radio is backed by a foundation of nine farm organizations and is non-profit-making. The groups back of it include New York State Grange, New York State Farm Bureau Federation, Cooperative Grange League Federation Exchange, Dairy-men's League Cooperative Association, New York State Federation of Home Bureaus, New York State Poultry Council, New York State Vegetable Growers Association, New York State Horticultural Society and New York Artificial Breeders Cooperative. Matching farm groups in other states are watching the Rural Radio hook-up with interest and look toward the day when it may be possible either to increase the number of stations on the



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SPOT RADIO NEWS

network or organize similar networks on a non-profit basis in other farm areas.

SO SUCCESSFUL was the 1947 National Radio Week that it will be featured again next fall, though earlier than last. That seems to be the consensus of leaders in the Radio Manufacturers Association and the National Association of Broadcasters, co-sponsors of the 27th anniversary celebration. Dates of the '48 show will be earlier to avoid conflict with the national elections. Nationwide participation of broadcasters, manufacturers, and the radio trade were reported on the '47 program and at least one significant event points a trend for next year. That was a civic celebration of National Radio Week in Cincinnati, sponsored by the Cincinnati Gas & Electric Co. This was so successful that it has been suggested that a special effort be made in 1948 to enlist all public utilities in the annual observance. Steps are already being taken toward that end, according to NAB president Justin Miller and RMA president Max F. Balcom. The RMA-NAB group also plan to carry the radio-in-every-room campaign over into the new year. One highlight of the '47 radio week was recognition by President Truman, marked by a letter to Justin Miller. "Please accept my heartiest congratulations," the President wrote. "You know already how strongly I feel the importance of radio communication to the welfare of the nation and of the world. In contrast with its use in totalitarian nations, radio in America has developed as a servant of the people, rather than as a servant of the government. This fact imposes upon American broadcasters the responsibility of striving always to improve and increase their contribution to better understanding among our citizens and among the nations of the world. I know that this responsibility will be met in a way that will reflect credit upon both the industry and the nation."

LOOKING AHEAD for the entire industry Mr. Balcom, RMA's president, sees as "excellent" the outlook for 1948 and the years ahead—"assuming that nothing happens to disrupt our present economy." "The next ten years," he adds by way of caution, "will, however, bring changes that will affect us all." Perhaps the most potent change factors, he believes, will be FM and television. "Both will continue to grow in importance in the field of home entertainment and will bring inevitable readjustments both in manufacturing and broadcasting."

MR. BALCOM STRESSES the importance of the radio-in-every-room campaign to the future health of the industry. "Instead of our having reached over 90 per-cent of saturation of American homes," he points out, "we are only about 37.5 per-cent of

(Continued on page 171)

RADIO NEWS

BOBBY-SOXERS

play their radios long and hard
.. buy plenty of tubes, parts, and repair time
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**RADIO
TUBES**

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January, 1948



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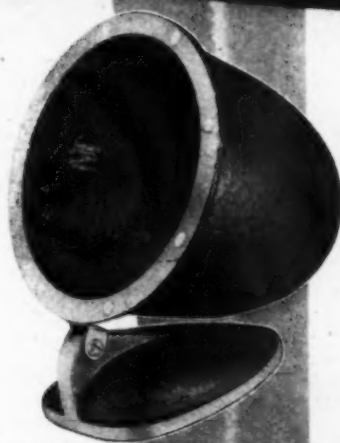
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AP-10 (ST-590) with 3-4 ohm voice coil	\$13.90
AP-10 (ST-591) with 45-50 ohm voice coil	14.50



MODEL AP-11 SPEECH MASTER (Panel Type)

Similar to AP-10 but without swivel base. Clearance eyelets for mounting screws. Mounts in $4\text{'-}27/64$ " cutout. Depth from front panel $4\frac{1}{2}$ ". Power rating 5 watts. Screws and drilling template furnished. Shipping weight $3\frac{1}{4}$ lbs.

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Specially designed reflex horn increases efficiency in mid-range, giving added effectiveness and punch to speech quality when used for paging, intercom and call systems operated at moderate levels. Reflex construction prevents direct access of snow or rain to speaker diaphragm. Power rating 6 watts. Space within case provided for mounting $\frac{1}{2} \times \frac{1}{2}$ " transformer. Over-all diameter 10", depth 8". Complete with bracket for wall or post mounting.

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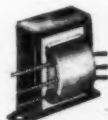
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- AMPLITUDE OR FREQUENCY MODULATOR MAY BE APPLIED
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- 1 PLATE TRANSFORMER 400-0-400 @ 200 MA 200-0-200 @ 65 MA
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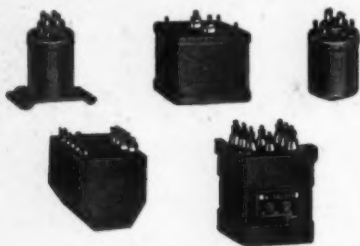
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X40—6.3V @ 22 amps., 6.3V @ 2.4 amps. CT. 6.3V @ 2.25 amps., 6.3V @ 0.6 amps. CT. 4 1/4" x 4 1/4" x 1 1/4". Your Cost..... **\$2.95**

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Primary 115v 60 cye. Secondary #1—876V CT. 0.0161 amps. Secondary #2—5V, 3 amps. 15 lbs.

XP8707—Your Cost Only..... **\$2.95**

3E29 (829B) BEAM POWER TUBE

XP8416—Your Cost Only..... **\$2.95**

Send for latest bargain flyer
Chock full of these and other bargains

Dept. RA8

Lafayette Radio
RADIO WIRE TELEVISION, INC.

100 Sixth Ave., N. Y. 13
110 Federal St., Boston 10
542 E. Fordham Rd., Bronx 58
24 Central Ave., Newark 2, N. J.

Within the INDUSTRY

JACK E. SNYDER, assistant general manager of *Concord Radio Corporation*, was elected president of the Chicago Chapter of the National Electronics Distributors Association (NEDA) at a recent meeting of that organization.



Mr. Snyder succeeds Al Oliver, deceased, to the presidency. In accepting the new post he asked members of the group to suggest specific business problems which will be used as the basis of discussions at meetings.

He has been associated with *Concord* for the past 17 years and is well-known in the radio industry.

WALLY B. SWANK, former sales manager of the *E. F. Johnson Co.*, Waseca, Minnesota, has recently formed his own organization in Syracuse, New York, where he will represent the manufacturers of several lines of electrical and electronic equipment for New York state, with the exception of the New York City area.

He is a graduate of *Purdue University* and served as a radio engineer for a Chicago radio manufacturer before serving as a manufacturers' representative in several Midwest territories.

Mr. Swank will maintain offices at 400 Cherry Road, Syracuse 9, New York.

K. BLAIR BENSON, formerly associated with *General Electric Company*, has been appointed Senior Engineer at *United States Television Mfg. Corp.*



At *General Electric*, Mr. Benson was in charge of the design and development of projection television receivers and worked on many electronic devices for military use as well as in the television receiver engineering division of the company.

As a specialist on projection television, Mr. Benson will devote his time at *UST* in that field.

NATIONAL SAFETY COUNCIL has announced the formation of a Radio and Electrical Equipment Manufacturers' Committee with a view toward developing another permanent section of the Council for industry-wide study and attack on accident problems.

The new committee is headed by

E. K. Taylor, safety director of *Zenith Radio Corporation*, with **O. C. Boileau**, safety director of the *RCA Victor Division*, serving as vice-chairman of the Radio and Electronics Division while **H. B. Duffus**, supervisor of the accident prevention service of *Westinghouse Electric Corporation*, is acting as vice-chairman of the Heavy Apparatus Division.

M. F. Biancardi, safety engineer of *Allis-Chalmers Co.*, is vice-chairman of the Light Apparatus Division, and **C. R. DeReamer**, general safety supervisor of *General Electric's* executive department, is serving as vice-chairman of the Appliance and Lamps Division.

C. E. Woodward, safety director of the *A. O. Smith Corp.*, will edit the Newsletter; **J. M. Transue**, protection director of *Philco Corporation*, is the sub-committee chairman. **G. W. Greenwood**, safety director of *Western Electric Co.*, is acting as secretary of the committee.

WILLIAM H. KNOWLES, chief engineer, heads the new Resistor Analysis Council just formed by *International Resistance Company* as a service to the industry.



Composed of a group of *IRC* electrical and mechanical engineers, plus production specialists, the new council operates as a consultant to engineers and designers, providing confidential analysis of resistor requirements for any mechanical or electrical resistor problem.

Interested engineers and designers may have the resistor requirements of their products analyzed by sending as much pertinent data as is available to the Resistor Analysis Council at *International Resistance Company*, 401 N. Broad Street, Philadelphia, Pa. There is no obligation to purchase *IRC* products.

JENSEN INDUSTRIES, INC., of Chicago, manufacturers of a line of phonograph needles, have appointed five new representatives to handle the company's product.

Herbert G. Arcadius, who was formerly connected with *Meissner*, is the new Midwest representative covering Indiana, Illinois, Michigan, and southern Wisconsin.

Robert M. Hardie, former sales manager of *Thordarson*, was named as representative for southern California. **A. J. Nelson** was appointed for the Rocky Mountain area.

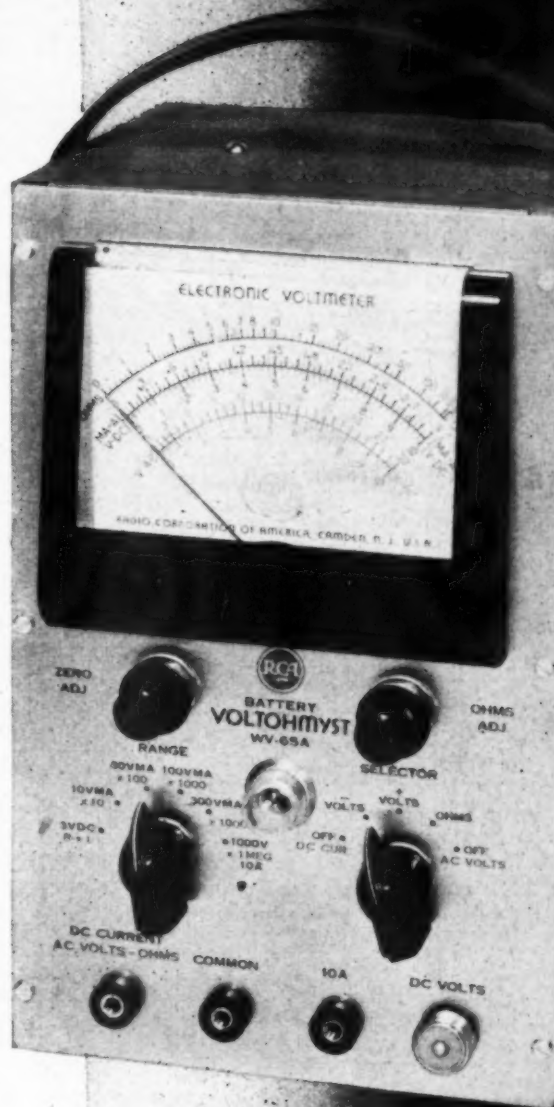
**you can use it
anywhere!**

ABOUT THE HANDIEST METER in the service field! In one instrument, for one price, you get an electronic voltmeter, ohmmeter, and ammeter . . . *battery-operated* to make it completely independent of power-line sources.

With it you can measure both a-c and d-c voltages to 1000 volts, resistance to 1000 megohms, and direct current to 10 amperes. A new low-cost, RCA crystal probe can be attached if you want to make v-h-f measurements.

Linearity and stability are excellent.

Here is one of the best buys in test equipment on the market today. We'll be glad to send you complete descriptive and price information on this time and money saver. See it at your RCA Test Equipment Distributor.



TEST AND MEASURING EQUIPMENT
RADIO CORPORATION
ENGINEERING PRODUCTS DEPARTMENT, C

In Canada: RCA VICTOR Company Limited, Montreal



**Bargain
Scoops!**

**EVERY ITEM
GUARANTEED
BRAND-NEW-PERFECT**

EAGLE ELECTRIC DRILL KIT

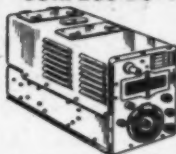


Complete set at less than you usually pay for a drill alone. Includes Fairchild 1/4" drill and 2 sets of carbon drills. A new streamlined design, fast, modern electric drill with a universal type motor—housing made of 2-piece cast aluminum alloy—improved sturdy keyless 3-jaw chuck. The two seven piece drill sets

each contain 1/16 to 1/4" by 32nds., one set for steel and one for wood. Packed in a compact, cardboard utility carry case. Operates on 110 Volt AC or DC.

No. 16A525, Complete.....**\$15.95**

SURPLUS BC-459-A TRANSMITTER



Converts Easily to a Hot YFO or 50 Watt CW Transmitter. Turning range 7.0 to 9.1 MC. Originally part of the famous SCR-274-N aircraft equipment. Constructed of high quality components to hold a calibration accuracy of 200 to 300 cycles. Consists of

a 1626 (or 12J5) triode variable oscillator driving two 1625 (similar to 807) beam tetodes in parallel. Has an excellent worm drive ganged tuning mechanism. Case is aluminum, size 12x7x5 1/4" wide. Furnished with tubes, 8 MC calibrating crystal, wiring diagram, and conversion suggestions, less power supply. BRAND NEW.

No. 36A63, While They Last.....**\$6.95**

12 1/2 Ft. ANTENNA TELESCOPES DOWN TO 1 FOOT 4"

"Just It" for mobile equipment, portable receivers, and transmitters. Ruggedly constructed—smooth telescopic action. Base is 3/8" dia. with 3/8" threaded shank.

38A39, Spec. Ea.....**\$1.95**

10 Lots Each.....**\$1.65**

140 MMFD MIDGET Variable



Finest quality ceramic insulated. Has 1/4" shaft 7/8" long.

No. 18A880, Spec. Ea.....**50c**



BUD 100 MMFD MIDGET VARIABLE Type MC 1855

Double bearing—steatite insulated. Air gap .024, 14 plate. Has 1/4" shaft 1/2" long.

No. 18A804
Special, Each.....**65c**

HANDSET TS-13

200 ohm carbon mike and 2500 ohm ear phone with butterfly switch, 6 foot cord, one each PL55 and PL58 plugs.

17A407
Spec. Ea. **\$2.45**



TRIMM Type "B" HEADPHONES



At Sensational Low Price. Extremely sensitive 2000 ohm DC resistance, 10,000 ohm impedance at 1000 cy. Molded black bakelite caps, Chrome steel magnets, Bronze steel headbands covered with textile webbing, sturdy thumb screw adjustment on yokes. 6 foot cord with standard pin tips.

No. 5A169X
Special Price.....**\$1.95**



10 Hy-200 Ma THORDARSON Filter Choke

200 ohm DC resist., 2000 V. RMS, size 2 3/8" sq. x 4 5/8" high. Fully enclosed in black case. 12" leads at side Wt. 5 1/2 lbs.

13A266, Spec. Ea.....**\$1.88**

COAX CONNECTOR



Fits RG8/u and other 52 ohm Coax. Standard Amphenol type

83-1SP.
No. 18A806, Spec. Ea.....**35c**

OHMITE P300 PARASITIC SUPPRESSOR



Get them while you can at less than 1/2 regular price

No. 18A593, Spec. Ea.....**55c**

JOHNSON VARIABLES



Dual section, 200 mmfd. per section. Spacing .045"; Type 200FD20. List \$10.00.

No. 18A510
Spec. Ea.....**\$1.95**

No. 18A509, Dual section 304 mmfd. per section. Spacing .045"; Type 300ED20. List Price \$9.95.

Special Each.....**\$1.95**

PARALLEL CORD BARGAIN PRICED

Standard No. 18 two conductor brown rubber parallel cord—the kind you use every day.

2A28X
100 Ft.....**\$1.65**

500 Ft.....**\$6.95**

For.....

ANTENNA WIRE BARGAIN



100 Foot Coils Stranded aerial wire. 3 strands copper tinned, 4 strands monel metal. Will not sag. Rustless

and stainless.

3A85
Spec.....**12**

Coils.....**\$2.50**

For.....

SHIELDED WIRE



Size 20, stranded tinned copper conductor, vinylite and cotton braid insulation, and overall tinned copper shield.

2A84
100 Ft.....**\$1.20**

500 Ft.....**\$4.95**

For.....

WEATHERPROOF WIRE

Stranded conductor, chemically treated impregnated braid insulation. Flexible and strong for long runs. Perfect for lead-ins, telephone, intercoms, etc.

4A502
Single Cond. 900 ft.....**\$2.95**

4A503, Three Cond.....**\$4.95**

(twisted) 550 ft.....

100,000 Ohm 100 Watt RESISTOR

Vitreous enameled. Wire wound, sizes 3/4x6 1/2".

18A789, Spec. Ea.....**45c**

"FLUORESCENT" BED LAMP



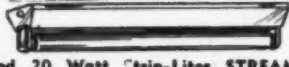
New 8 watt fluorescent lamp for comfortable, safe "reading in bed." Focuses a flood of good reading light at exactly the right angle to eliminate eye strain. Rubber covered hookover brackets fit any style of bedstead. Complete with lamp and 7 1/2 ft. cord.

Walnut Net **\$4.17** 6 at **\$3.89**

32A215 Each.....

Our terms: Cash with order or COD with 20% deposit please. Add Postage

RED HOT "FLUORESCENT" SPECIAL



15 and 20 Watt Strip-Lites STREAMLINED. Top quality components, material, finish and workmanship! Complete with lamps. Underwriter's Approved! Made of heavy gauge steel with baked white enamel finish. Sizes 3 1/8" wide, 15 watt is 18 1/4" long, 20 watt 24 1/4" long.

15 Watt **\$3.15** 6 For.....**\$16.95**

32A45 Ea.....

20 Watt **\$3.35** 6 For.....**\$17.95**

32A46 Ea.....



Did You Get It?

1948 Cat. No. 481

IF NOT—WRITE

BURSTEIN-APPLEBEE

Company

1012-14 MCGEE STREET.

KANSAS CITY 6, MISSOURI

A. T. R. Armstrong, now operating the *Controlite Engineering & Sales, Ltd.*, of Toronto, will be the new *Jensen* representative for the Dominion of Canada outside of British Columbia and Alberta.

R. T. Bork was named to service the Minneapolis-St. Paul area.

ANDREW SMOY, president-owner of the *A. J. Smoy Co.*, recently announced the outright purchase of *The Atlas Coil Company* of Chicago.



Plans are now being formulated to consolidate the manufacturing facilities of both companies under a single roof. The *Smoy* organization, which is located at 3451 West Belmont Avenue in Chicago, manufacture transformers, coils, and special components.

Mr. Smoy was formerly production manager of the *Transformer Division* of *Utah Radio Corporation*. He was associated with that company for 16 years.

P. R. MALLORY & CO., INC., has instituted a new merchandising program designed to assist radio servicemen in developing their businesses.

The program, "Good Service for Good Business Plan," makes available to servicemen a complete kit of material for improved shop identification, customer follow-up activity, and simplified service records.

A program of service meetings under the sponsorship of *Mallory* distributors is now under way. A sound film covering all details of the plan, together with information on recent developments in the company's products are featured at the meetings.

JOHN K. WEST has been elected to the post of Vice-President in charge of Public Relations for the *RCA Victor Division of Radio Corporation of America*.



Mr. West previously was the Director of Public Relations for *RCA Victor*, a position to which he was appointed in 1945. In this capacity he was largely responsible for the creation and development of the *RCA Exhibition Hall* in Radio City, of which he is manager.

Associated with *RCA Victor* since 1930, Mr. West has served the company in various capacities.

JOHN L. UTZ was recently appointed manager of the Atlantic Division of *Philco Corporation*.

Joining *Philco* in 1936 in personnel work, Mr. Utz was soon transferred to sales in the Philadelphia organization of *Philco Distributors*. In 1940 he became the district representative

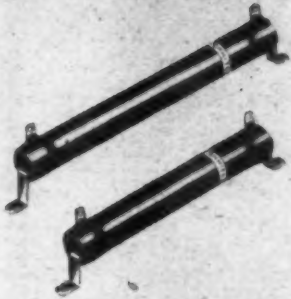
(Continued on page 108)

RADIO NEWS



Be Right with.. OHMITE

Wire Wound Resistors



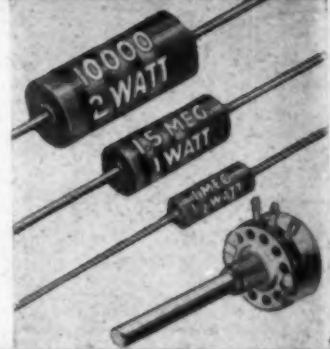
Ohmite offers a complete line of dependable resistors wound on a ceramic tube and protected by vitreous enamel. Ratings from 5 to 200 watts. Available in the fixed type for general use, and in the "Dividohm" type with adjustable lugs for use as a multi-tap resistor or voltage divider. Many standard types and mountings.

Composition Resistors and Potentiometer

"Little Devil" resistors are individually marked. In $\frac{1}{4}$, 1, and 2-watt, $\pm 10\%$ tol. Also $\pm 5\%$ in $\frac{1}{4}$, 1-w sizes. RMA values, 10 ohms to 22 megohms.

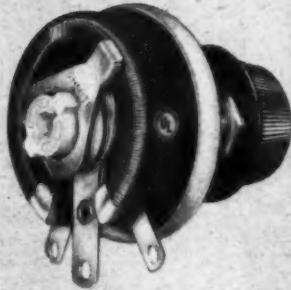
Type AB, 2-watt molded element potentiometer for industrial use. 50 ohms to 5 megohms in linear taper.

Both items sold only through Ohmite distributors.



Vitreous Enameled Rheostats

Available in 10 sizes, ranging from 25 to 1000 watts, in a wide range of resistances. Ceramic parts insulate the shaft and mounting. The resistance winding is permanently locked in vitreous enamel. The metal-graphite brush provides unmatched smoothness of action. Engineered and constructed for long, trouble-free life.

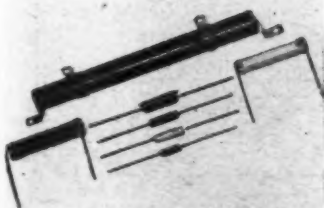


Non-Inductive Resistors



Used as dummy antennas for radio transmitters, load resistors in high-frequency circuits, terminating resistors for radio antennas. Vitreous-enamel type wound on a tubular ceramic core. Also dummy antenna units consisting of several resistors arranged concentrically, connected in parallel. Sizes: 50 to 250 watts.

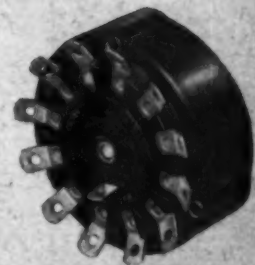
Radio Frequency Plate Chokes



To adequately cover higher radio frequencies now used by amateurs, police, and other communication facilities. Single-layer wound on low power factor steatite or molded plastic cores and covered with a moistureproof coating. Seven stock sizes from 3 to 520 megacycles. Two units rated 600 ma; all others 1000 ma.

All Ceramic Tap Switches

A popular switch for use with tapped transformers in power supply units. Compact, dependable, and convenient to operate. Available in ratings of 10, 15, 25, 50, and 100 amperes, A.C. Contacts are of the silver-to-silver, non-shorting type. Switch shaft is insulated by a strong ceramic hub. Ceramic body is unaffected by arcing.



OHMITE MANUFACTURING CO., 4883 Flournoy St., Chicago 44, U. S. A.

OHMITE

Write Today for
Ohmite Catalog No. 19

Provides 16 pages of useful data on the selection and application of rheostats, resistors, tap switches, chokes, attenuators, and other equipment.



RHEOSTATS RESISTORS TAP SWITCHES CHOKES

January, 1948

31

CRYSTALS!

In the greatest purchase of radio transmitting crystals ever made by one wholesaler in the history of the Radio Parts Industry, Sun Radio acquired title to over a half million dollars (\$500,000.00) of Army Surplus, precision built, exactly tuned crystals in moisture proof holders which are shock mounted. Can you visualize the immensity of this stock of ours! ... thousands, or should we say miles, of gleaming BRAND NEW CRYSTALS IN MOISTURE PROOF HOLDERS manufactured by the world's finest crystal manufacturers (RCA, Billey, Western Electric, Valpey, etc.) lying in long rows; lovely to look at but even better to own. We can't claim that we can supply every frequency, because they are offered "First come, first served", but we do claim that we can supply the early birds with the below listed frequencies AT THE LOWEST PRICES YOU HAVE EVER SEEN. ... We say it's sensational!!! Please note that crystal shipments of 6 or less are packed in cloth containers to expedite handling. ... No worry because all crystals are shock mounted and guaranteed delivered perfect. All crystals have Army MC harmonic ratings but Sun encloses directions for deriving the correct fundamental frequency in kilocycles. ... And all frequencies are checked before shipment to insure your satisfaction. And remember, you may never again see the day that you can buy BRAND NEW CRYSTALS IN MOISTURE PROOF HOLDERS at the prices that we have listed here. ...

CRYSTALS WITH A MILLION USES

Fractions Omitted									
412kc	423kc	434kc	444kc	459kc	474kc	488kc	498kc	509kc	
413	424	435	445	462	475	490	501	511	
414	425	436	446	463	477	491	502	512	
415	426	437	447	466	479	492	503	515	
416	427	438	448	468	481	493	504	516	
418	429	440	451	469	483	494	505	518	
419	430	441	453	470	484	495	506	519	
420	431	442	457	472	485	496	507	522	
422	433	443	458	473	487	497	508	523	

**49c
EACH**

I.F. Frequency Standards	Crystal Frequency Standards	For Crystal Controlled Signal Generators
450kc 454.166kc 461.111kc 451.388kc 455.556kc 464.815kc 452.777kc 459.259kc 465.277kc	98.356kc Easily altered for 100kc Standard Mounted in low loss 3 prong holder	525kc 526.388 531.944 536.111 527.777 533.333 537.500 529.166 534.722 538.888 530.555
99c EACH	3.89 EACH	99c EACH

Assorted Miscellaneous CRYSTALS					For Ham and General Use				
Fractions Omitted					Fractions Omitted				
370kc	375kc	379kc	383kc	387kc	390kc	394kc	398kc	404kc	408kc
372	376	380	384	388	391	395	401	405	409
374	378	382	386	390	392	396	402	406	411
376	380	384	388	392	393	397	403	407	
priced at a fraction of the cost of their holders alone.					79c EACH				

* Payments must accompany order. Enclose 20c for postage and handling. Minimum order—\$2.00 plus postage.
† Crystals are shipped packed in cloth bags inasmuch as they are shock mounted. All shipments guaranteed.

I-222 Signal Generator



Brand new; Frequency from 8 MC to 230 MC in 2 bands. Calibration graph furnished. Crystal controlled check points. 110V AC power supply. Output attenuator. Dial calibration 10 points per division. A true laboratory instrument.

A \$350 value for only.....**\$54.95**



HV Mica Condensers

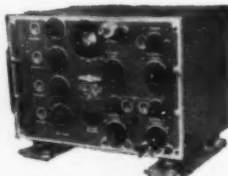
.005 mfd. 2500 W.V., A sensational value.**49c Each**
3 FOR.....**\$1.25**

100 WATT BENDIX TRANSMITTER

Four Separate Electronic Coupled Oscillators

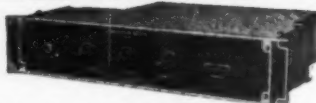
These can be easily converted to 20-40-80 meters. Crystal required for 10 meters. Each electronic coupled oscillator dial has 3000 divisions enabling quick precision shifting. This transmitter was constructed of the highest quality of precision parts, with laboratory precision. Four separate output tanks; one 4-position selector channel switch having seven sections which changes the ECO, IPA and output tanks simultaneously. All the controls are mounted on the front panel. The housing is cast aluminum; shields and case are sheet aluminum. Dimensions 11 x 12 x 15 inches, weighing 35 1/2 lbs. Complete, simple instructions for conversion furnished. Uses three 807, four 12SK7 tubes; one 2-inch .5 amp. R.F. meter.

A complete coverage transmitter, for the new or experienced amateur. A TRUE HAM VALUE—BRAND NEW, complete with tubes.....**\$49.95**



110 Volt AC Superheterodyne Receiver

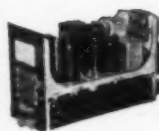
This crystal fixed frequency receiver comes with full conversion instructions for variable tuning of all ham bands and broadcasts. A highly selective superheterodyne receiver, 110 V.A.C. power supply built in. Uses the following tubes: 6K7 RF Amplifier; 6F7 Detector and A.V.C.; 6C8 Output and Noise Suppressor; 80 Rectifier. Dimensions: 3 1/2 x 19 x 11 1/2 inches. Comes complete brand new, with one set of coils and two sets of tubes.....**\$16.95**
Extra Coil Sets With Set Only.....**\$2.95**



Sun Radio

FOR THE HOTTEST VALUES IN Surplus Parts

SPERRY AMPLIFIER



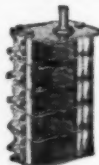
Manufactured by Sperry Gyroscope Co. These amplifiers contain 2 beam power output tubes (1632) similar to 25L6, 2 twin triodes (1633 & 1634) similar to 6SC7, 2 mica condensers, dozens of color coded half watt resistors, 3 bathub condensers, 2 dual bathub condensers, 1 bathub condenser with 4 sections, 3 hermetically sealed transformers, 2 wafer shielded rotary switches with resistor assembly, 1 volume control, 4 octal sockets, measurements 9 1/2" x 5 1/2" x 3 1/2". Brand new. Easily converted to excellent audio amplifier.....**\$3.95**

WAVEMETER BC-1073A



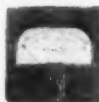
These units are only slightly used and are guaranteed in good condition. They contain a high quality resonant cavity wavemeter, oscillator, heterodyne amplifier, electric tuning eye, complete with nineteen tubes (8-6SN7-GT, 1-6SJ7, 1-6SA7, 2-6V6GT, 2-6H6, 1-5Y3GT, 1-9002, 1-9006, 16U5, 1-6SF5) 110-volt A.C. power supply. 27" x 20" x 6 1/2"—Net weight 85 lbs. These units tune from 150 to 210 megacycles. Original cost \$550.00, your cost.....**\$24.95**

5-GANG TUNING CONDENSER



Brand new... 5-gang, 365 mmfd. per section... a truly precision built condenser. Each rotor and stator individually separated with ceramic insulation. A \$13.50 value in the greatest offering ever made in tuning condensers for only.....**\$2.95**

AC VOLTMETER



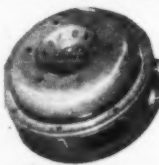
Brand new Westinghouse 3" square panel meter 0-150v Ideal for checking primary voltage.....**\$3.49**

TS13 HANDSET



Combining a 200 ohm carbon mike and 2500 ohm earphone with butterfly switch for talk-listen. Has 8' flexible rubber cord with 1-PL55 and 1-PL68 plugs attached. BRAND NEW.....**\$2.95**

NAVY SPEAKERS



Stromberg Carlson and RCA waterproof speakers. Brand New in original cartons. 25 Watt PM driver unit with projector mounted in heavy duty round metal baffle. Ideal for communication receivers and sound systems at the lowest price ever offered.....**\$14.95**

ANTENNAS

(A) Small four-section telescopic aerial ideal for portable receivers, transceivers or test equipment.

99c

(B) 22" tapered high frequency aerial covering 150 to 200 MC. Ideal for mobile or fixed station use.

\$2.69

WALKIE TALKIES

\$69.95

EACH

SET

\$129.90



Walkie Talkies, BRAND NEW, operating weight 27 1/2 pounds including knapsack. Range up to 25 miles in open country. Frequency 52.8 to 65.8 MC. Transmitter and receiver with regular hand set. Each unit comes complete with spares included as pictured. Ready to operate.

TERMS: All Items F.O.B. Washington, D. C. All orders \$30.00 or less cash with order. Above \$30.00 25 per cent with order, balance C.O.D. Foreign orders cash with all orders, plus exchange rate.

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OF WASHINGTON, D. C.

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30,000

Successful Radio Service Technicians Read RADIO MAINTENANCE Every Month

RADIO MAINTENANCE is the magazine of ideas and information for profitable service shops. It helps maintain secure, high quality operation. Where you find RADIO MAINTENANCE, you'll find successful servicing!

Each month RADIO MAINTENANCE brings you the latest developments in television, radio and electronics by top experts in the field. Each article, each department is carefully edited and presented to help you in your daily work. All these articles are invaluable as reference material; and all the articles together will form a complete reference library on everything in the radio servicing business. In the coming year, RADIO MAINTENANCE will bring you a complete series on each of the following: AM—FM—Television—Signal Tracing and All Test Equipment—Low Cost Business Promotion Methods—Sales Techniques for Servicemen—How to Make Huge Profits in the Sound Installation Business. Each article in a series will be a compact unit in itself—combined with the others of its series, they form a complete education—a complete service library—to bring you prestige, profit and security in your own radio servicing establishment. (A subscription to RADIO MAINTENANCE is tax-deductible, too!)

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FM continues to grow more and more rapidly. RADIO MAINTENANCE is keeping pace with this development in its series on FM. Our readers have enthusiastically received our previous articles on this subject and are asking for more. Every article will give thorough coverage—completely illustrated—of a specific phase of FM. All these articles will form a complete reference library on the subject—a library that will always be up-to-date—always handy—providing easy-to-understand information by top experts. RADIO MAINTENANCE rapid, trouble-free servicing techniques are here applied to FM. The latest type of test equipment is explained and illustrated. All circuit diagrams are clear and easy to follow. With this invaluable reference library you will have the advantage in FM. Get your subscription order to RADIO MAINTENANCE in today and every servicing advantage will be yours!

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BOLAND & BOYCE INC., PUBLISHERS

January, 1948



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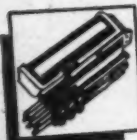
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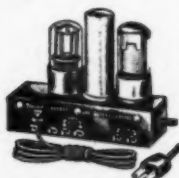
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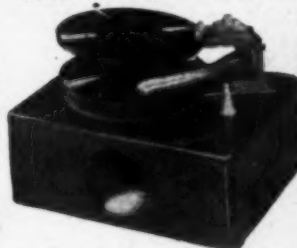
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Oil filled and impregnated. Single hole mounting. Size 4¼ x 1½". 4 mfd., 600 working volts, DC. **59c**
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Quality crystal pickup mounted in arm for 10" and 12" records. Mounting included. Requires ¼" hole. Shielded lead and cartridge case. Aluminum die cast arm finished in smooth dark brown. With semi-permanent needle. **\$1.69**
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January, 1948

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TRIPLETT ELECTRICAL INSTRUMENT COMPANY, BLUFFTON, OHIO



GUIDED MISSILES

By

C. E. CHAPEL, 1st Lieut., U.S.M.C. (Ret.)

Consulting Ord. & Aero. Eng. and
Chief of Research & Development,
Northrop Aeronautical Institute.

The "Gorgon IIC," a guided missile which can carry 1000 pounds of general purpose explosive to the target at a speed of 100 miles per hour.

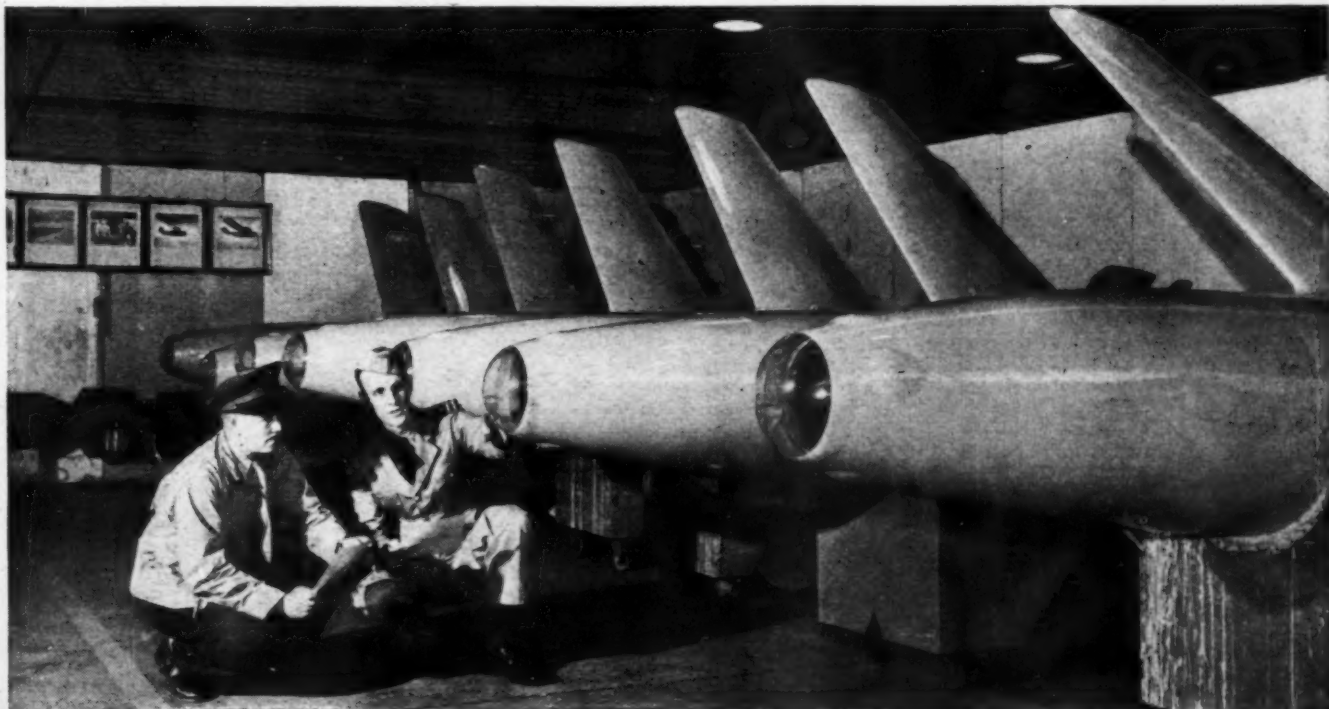
A new era of pilotless aircraft for war and peace has been inaugurated. Radio and electronic equipment again plays major role in these developments.

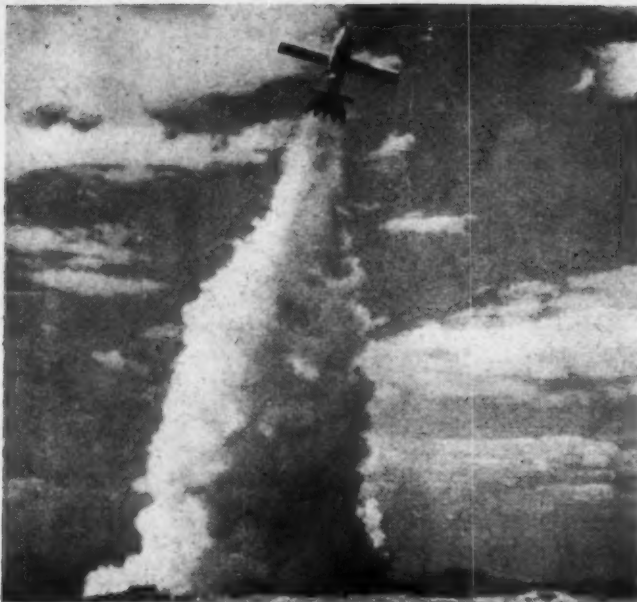
THE atom bomb and guided missiles will be the principal weapons for the defense of the United States of America in any future war. None of us want war, but we all want to be ready for it if it comes. Radio operators, radio technicians, radio servicemen, and everyone who has the slightest interest in the broad field of electronics should possess a basic understanding of the fundamentals of guided missiles. Reduced to their simplest terms, they are nothing more than new applications of vacuum tube circuits.

Definition of Guided Missile

In order to obtain a clear idea of the design, construction, and operation of guided missiles it is necessary to

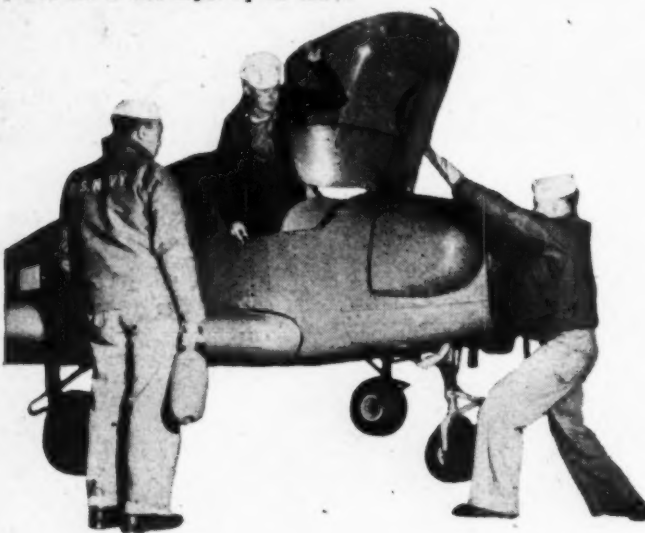
A group of guided missiles undergoing final inspection at the Naval Air Modification Unit, Philadelphia. Each of these pilotless aircraft is equipped with an intelligence unit enabling it to seek out and carry its explosive load directly to the chosen target.



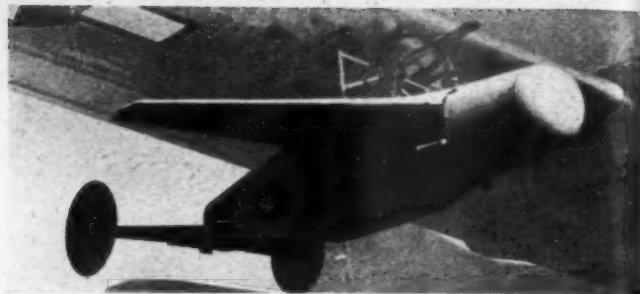
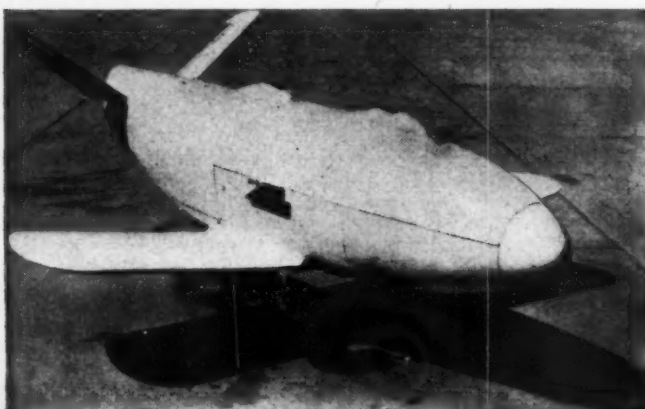


Guided missile roars into the air with the aid of four Mons-auto rockets. After expiration of the thrust of 40,000 pounds, the rockets and sled will fall free and the "Loon" will head out over the Pacific to its target.

Navy target drone, used for gunnery training of Navy personnel, is prepared for a test flight by its crew.



The "Gargoyle," an air-to-ground, radio-controlled powered glide bomb, carrying a standard 1000 lb. general-purpose or armor-piercing payload. It can be launched from airplanes.



Launched by Navy "Privateer" patrol bombers outside the range of enemy anti-aircraft fire, and guided to distant targets by radar, these Navy "Bat" bombs sank many tons of enemy shipping. Operating on somewhat the same principle as live bats, which emit a short pulse of sound and direct themselves by the echoes, robot bats are guided by radar echoes from the target. Approximately 12 ft. in length, with a 10 ft. wing span, the "Bats" carry a heavy load of high explosives. Two "Bats" are carried by each "Privateer," the Navy's giant patrol bomber.

agree upon certain terms which are commonly used. First, a missile is a weapon which can be thrown or projected through space, such as a spear, an arrow, or a bullet. Each of these objects is guided along its flight path at the moment of its launching, but thereafter it is subjected to various external forces that affect the accuracy with which it travels toward the target.

Second, a guided missile may be defined as a weapon which travels through space and carries within itself a means for controlling its path of flight. This definition is broad enough to include bombs, rockets, and even conventional airplanes. For example, a pilotless aircraft is a guided missile having aerodynamic surfaces large enough to supply the principal support for the aircraft in flight. Therefore, the lessons learned from the operation of pilotless aircraft may be applied in the design and construction of other forms of guided missiles.

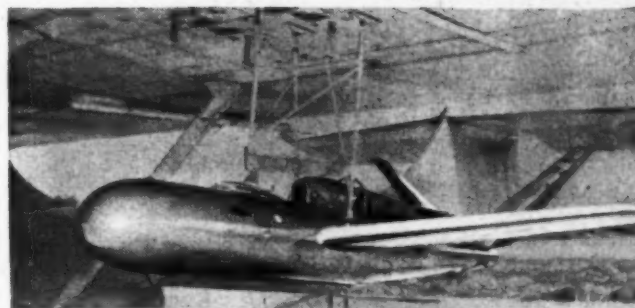
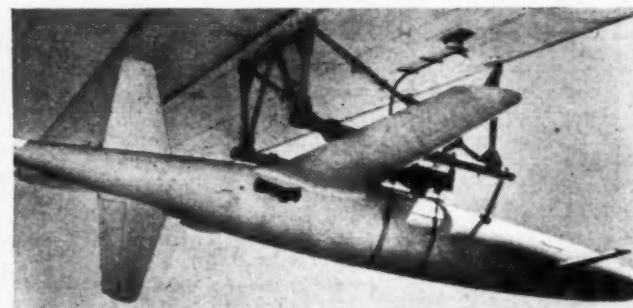
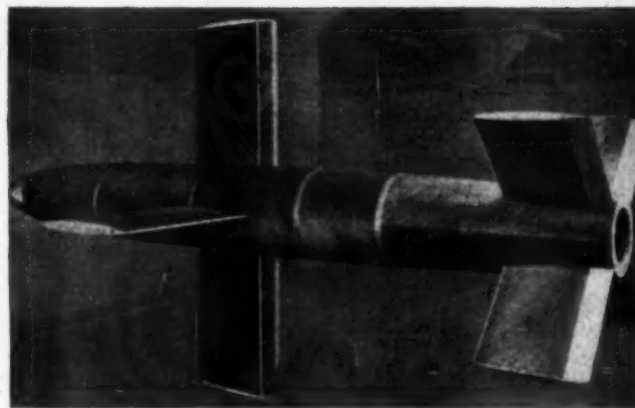
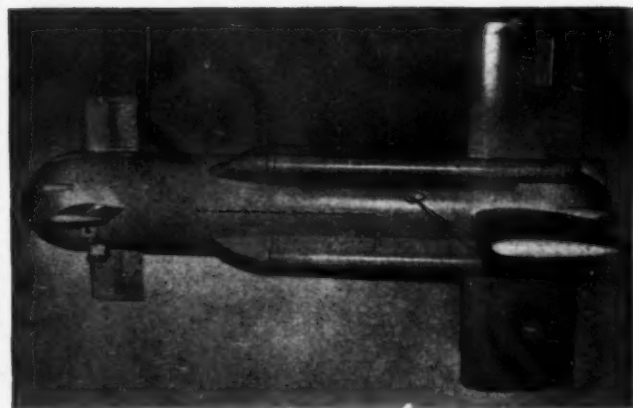
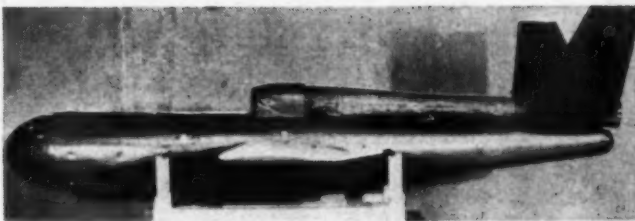
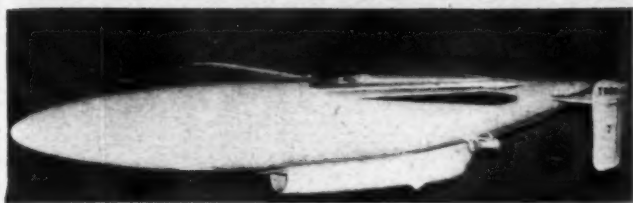
Classification According to the Place of Launching and the Target

Guided missiles may be classified according to the place of launching and the target. In general, they may be launched from the surface of the earth, either from the land or from the sea, or they may be launched from some type of aircraft. Thus, they may be launched from the ground, from a ship, or from an airplane.

In a similar manner, guided missiles may be classified according to their targets, which may be ground installations, ships, or aircraft. Considering the place of launching and the target together, the classification breaks down into the following types: (1) Ground-to-air, (2) ship-to-air, (3) ground-to-ship, (4) ship-to-ship, (5) ground-to-ground, (6) ship-to-ground, (7) air-to-air, (8) air-to-ground, and (9) air-to-ship. (Continued on page 122)

The "Gorgon," a guided missile resembling a freak-tailed white shark, carries a 100-pound, specially-shaped charge and is sent at a speed of 550 m.p.h. through air, by a rocket power plant.





The TD2N-1, an air launched target, jet powered guided missile.

The KDD "Katydid," a jet-propelled, radio-controlled pilotless drone used as a practice target for fighter planes. The span is 12 feet, 2.6 inches, and the length is 11.1 feet. Equipped with a resonating jet engine equivalent to 45 hp. and having a speed of over 200 m.p.h., it can perform all the maneuvers of a fighter plane through radio control of the "rudder-vators" in its V-shaped tail. It can remain aloft 40 minutes, when a parachute packed under the forward hatch is released by a radio signal. This turns off the jet and allows the drone to float to earth where it can be recovered for further use.

The KAN-1 or "Little Joe," a short-range anti-aircraft missile designed to be launched from a shipboard catapult, with the aid of standard rockets. It is radio-controlled, flare-sighted, and powered by "Jato," a Navy-type solid fuel rocket.

The "Gorgon" slung underneath a Navy PB4Y-2 (Navy modification of Consolidated-Vultee's Army B-24 four-engine heavy bomber) ready for test flight. This is an air-to-air guided unit.

January, 1948

The KUW-1, "Loon," pilotless aircraft propelled by jet engine.

Another type of jet powered target missile being used by the Navy. Known as the KDD-1 "Katydid," it is designed to be launched either by catapult or from a target-carrying aircraft.

Mockup, or exact sized model of the KAQ-1, popularly known as the "Lark," one of the air-launched test-type guided missiles.

A radio-controlled, jet-powered target drone resting in its launching rack under the wing of a Navy PB4Y. This is a small pilotless aircraft whose flight can be made to simulate suicide dive bombers and torpedo plane attacks. Working on the principle that a "few hours on a drone is worth two weeks of any other kind of gunnery training," the Navy went all out to develop target drones for the benefit of its anti-aircraft gunners. These target drones were frequently used while the fleet was on its way to and returning from attacks against the enemy and proved far more popular with the gunners than the usual type of towed sleeve targets used by the Navy before the development of this type of more realistic target.

Utility Amplifier Unit

Construction details for an audio amplifier that features high fidelity performance on phono or mike input.

By
THOMAS A. PATTERSON, JR.

OCCASIONALLY the need arises for an amplifier which must be inexpensive and yet render a fairly high degree of fidelity. To fulfill this purpose the unit and circuit described herein was developed. One of the major factors entering into the design of this equipment was its future use as a part of a unitized, all-purpose receiver set-up.

At the present time an old but faithful communications type receiver is being used as an AM tuning unit, with an FM tuner under construction and a new all-band AM tuner in the planning stage. These new and extremely interesting tuning systems are companion units of the amplifier.

The chassis used for the amplifier is a standard commercial make, light gauge steel, 7½" by 9" by 2" deep. The entire circuit diagram of the unit, as it is presently in use is shown in Fig. 3.

The power supply section was built with a 40% safety factor, thereby providing a satisfactory operating level

Fig. 1. Top view of home-built amplifier unit. Speaker is mounted separately.



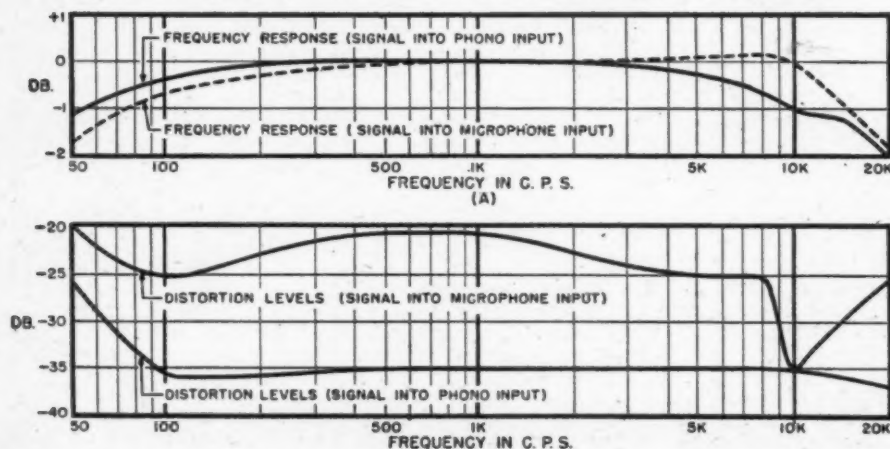
without need for voltage control or a regulating system. The power transformer is a *Stancor* P-6012, delivering 350-0-350 v.a.c. at a rating of 90 ma. Since the total drain of the circuit is approximately 65 ma., this unit is ample. Any other commercial unit of similar rating can be equally well employed, the other requirements being 6.3 v. at 2 amps., and 5 v. at 2 amps. The rectifier tube selected is a 5Z4, though there are others which may be substituted if more readily available—such as a 5W4 or 80. The original resistance type filter circuit shown in Fig. 3 was slightly different from the one used in the present model. How-

ever, since it is interesting and occasionally necessary, it is also shown. This system, which allows the use of a PM speaker, is merely a brute force filter circuit with dropping resistors for the various voltages, and carefully placed electrolytics to eliminate last traces of hum. Without a doubt, the present method is far more satisfactory, not to mention the gain in quality to be had from using a dynamic speaker.

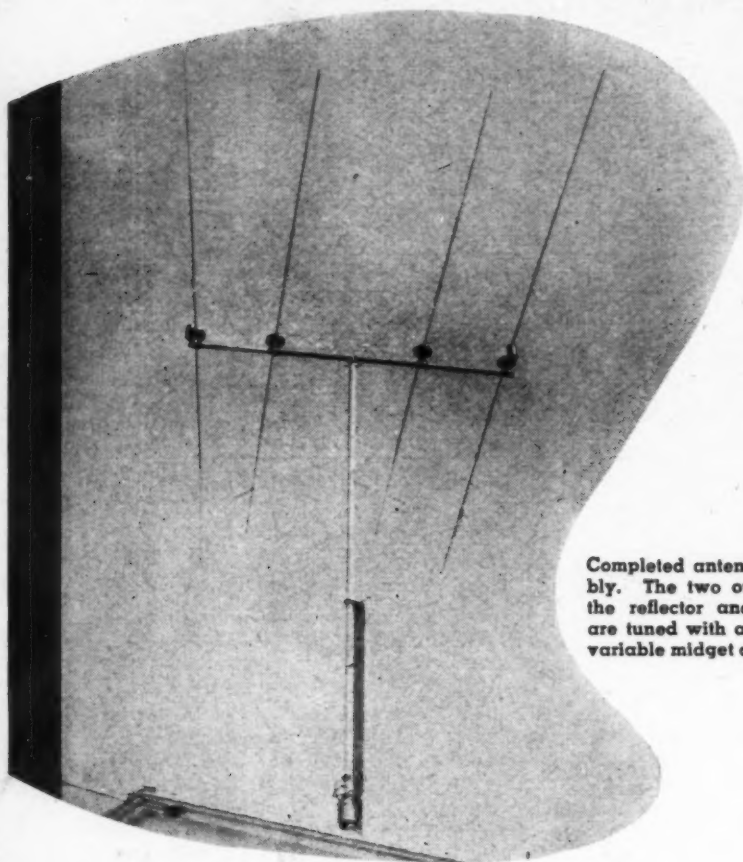
Other than circuit components and their values, there is little or no startling innovation in the amplifier circuit as a whole. As mentioned before, the future use of this unit as a part of a large receiver design was the governing factor in planning the input circuits. The first stage, a 6SJ7, has a high voltage gain characteristic, high enough to handle the low output of a crystal microphone or a photoelectric cell such as is used in sound motion picture equipment. As a verification of the latter statement, the author has used the first two stages of the original design model to feed push-pull parallel 6L6's in an emergency at a small theater with more than satisfactory results. A gain control is not used on this stage, but is incorporated at the input of the next following stage. At this point better and smoother control operation is obtained since the possible control noises are not amplified by the high gain circuit.

It might be wise to mention at this point the fact that the grounding of

Fig. 2. Frequency response and distortion levels of amplifier. Curves were plotted with 0 db. reference level at 1000 cycles. A —35 db. distortion level represents 1.8 per-cent distortion, while —25 db. represents 3.8 per-cent distortion.



NEW TYPE ROTARY BEAM



Completed antenna assembly. The two outer arms, the reflector and director, are tuned with a 100 μ fd. variable midget condenser.

Modified W8JK end-fire array for 10 meter operation, with reflector and director, which can be built in your spare time.

By C. V. HAYS, W6RTP

IN COMMON with most hams, the author has spent not an inconsiderable amount of time in thinking about the problem of effective antenna systems. While practically all types of commonly used beam antennas have their good points, it is a common occurrence to get one built up, mounted at a reasonably decent height, and then discover that the cussed thing is very hard to tune, doesn't take a load, tunes too sharply, etc., etc., necessitating further work in really getting impedances matched and the whole system perking.

While all the foregoing is just part of being a member of the genus "ham," all of us can definitely forego all but a minimum of labor in building and tuning the unearthly contraptions necessary to this business of working DX. After all, time spent in working the boys across the ponds is much more productive of the coveted WAC, etc., than interminable fiddling and climbing hither and yon to get an antenna working, so we decided to see if some simple, easy gadget couldn't be contrived to do the trick.

First and foremost, we wanted a system that wouldn't require a sixty foot elevation to work out. To fit

the majority of ham needs on ten meters, something about sixteen feet high was made a "must"—naturally heights greater than this, up to about forty feet, will work even better, but sixteen will do. This height of sixteen feet, attainable by anyone, has resulted in S9 reports from practically all the United States area, S8 and S9 from Canada, S9 from Kwajalein, S7 from Japan, and S7 from Germany, all on ten meter fone, of course.

Second, we wanted an all metal support, easily procured and inexpensive. Third on the list was ease of feed. We figured that some of the boys would want to use 300 ohm line, some 50 or 75 ohm, etc., so all were counted in the final design. Fourth, the antenna must not be one for a narrow range of frequency only. Fifth, and last, were the items of a broad nosed pattern in a horizontal plane so that the thing wouldn't have to be smack on a station to raise him or hear him, and, that all important matter, a vertical radiation pattern that concentrates as much energy as possible at the lowest practicable angle.

Once we figured what we wanted, the next question was just how to

get all that imposing list of features. Out came the library on antennas, and finally the choice was made—a modified W8JK end-fire array, with reflector and director. The so-called Kraus Beam has, to our mind, one fault, and several very good points in its favor. The fault, as we see it, is its bi-directional pattern—we wanted attenuation to the rear, especially for receiving. The points in favor are its compactness, ease of tuning and matching, broad-nose pattern (horizontally) tolerance to element length, and most important its property of having the lowest vertical angle of radiation of any comparable system presently available using horizontal elements. This last property was the real clincher—that decided us, then and there.

We had, then, an "ideal" basic antenna system, with the one drawback of bi-directivity. Further reading revealed a disconcerting lack of information on the use of reflectors with such a system, to achieve uni-directivity, so we started from scratch and figured out what seemed a reasonable remedial solution, which was simply to place a reflector a tenth wave from the antenna proper, and then, for good measure and to balance things up, we decided to place a director on the other side, likewise spaced a tenth wave.

From experience in tuning other systems, we were averse, on the score of general laziness mainly, to tuning the thing by sliding the outer ends of telescoping elements; that system of tuning also is liable to lead to some unbalance, unless great care is taken to see that both sides are exactly the same length. An over-the-air conversation with W6DAX brought out his use of 100 μ fd. condensers in series with each parasitic for tuning, and accordingly we adopted the idea. It has worked beautifully, it being necessary only to set up a field strength meter (or a remotely located receiver with S meter), aim the beam at it, turn the condensers for peak forward and minimum backward response, and the beam is tuned, once and for all. The antenna proper needs no tuning, if cut for the center of the band or thereabouts.

The system shown in the drawing and the picture uses elements and
(Continued on page 156)

RADIO NEWS



Sales PROMOTION Means More BUSINESS

By **DR. LOUIS BADER**

Assoc. Prof. of Marketing, School of Commerce, N. Y. U.

**Carefully planned promotions
and well-thought-out publicity
are keystones to a successful radio
business. Try these tested ideas.**

A GREAT many of the men who have established themselves in a radio service business have done so as a way of living. They are individualists who want to do the kind of work that suits them and who want to be free to work as they wish. If such men have a wide knowledge of radio and good mechanical ability, there is no reason why they shouldn't be able to show the first requisite for success in the business—the ability to repair radios properly, to make the machines perform again to the satisfaction of their customers.

In a great many cases this is all the radio serviceman has—the ability to repair,—and in turn he makes a living out of that ability. It takes time because his knowledge or ability to make good repairs is passed around by word of mouth and more and more people get to know about the good mechanic. This type of advertising seems to work better in small towns and villages. In such places the radio serviceman was born, grew up and, therefore, is known to many of the local people. In the larger cities it probably takes longer to become known. The radio serviceman may be

a stranger in the community; people do not know each other so well, and they do not readily converse with one another and talk about their radio troubles. Word of mouth advertising is not so important an aid. The radio serviceman, under such conditions, may use up his capital and patience waiting for enough trade to come his way to make a living. He closes down his business, looks for a job and, apparently, that's that. For him it is a tragedy which quite possibly might have been avoided.

There are over 60,000,000 radio sets in use in the United States. In the course of several years millions more will come into use and just as soon as price and incomes permit, millions of television sets will be bought. Sooner or later all of these must be serviced. In fact it would pay owners of radios to have them checked once a year to get the greatest satisfaction from them, and television sets may need checking even more frequently. There is no question that there ought to be a great deal of business for servicemen year in and year out and almost more in depressions and war periods than at other times. Yet too many

servicemen have to wait too long to build a business and all too many make only a meagre living. There is no need for this.

There are available to the radio serviceman all the tools of sales promotion just as there are to any other business man. Our most successful enterprises have made use of them and the future competitive situation is going to force business men to use sales promotion tools more intensively and extensively than ever before. So why not, Mr. Radio Serviceman, look into some of the possibilities of these devices. A business man may make the best mouse trap but unless he lets people know about it he is going to wait a long time to build up a good paying business. But let him shout about it from the house tops and before long he will be making mouse traps for the whole world.

There is your problem, Mr. Radio Serviceman—how to let the largest number of people know, continuously and at the lowest cost to you, that you are the best radio serviceman in your community.

Put first things first, and the first
(Continued on page 145)

Fig. 1. Chassis layout of Dynamic Noise Suppressor amplifier. Indicator tube shows action of high and low frequency gate circuits.



DYNAMIC Noise Suppression CIRCUITS

By

JOHN D. GOODELL

The Minnesota Elec. Corp.
St. Paul, Minn.

***Circuit analysis of the Hermon Hosmer Scott Dynamic Noise
Suppressor unit which has received industry-wide acceptance.***

UNTIL very recently it was generally believed that wide range record reproduction required acceptance of objectionable noise. Many people whose enjoyment of music was dependent on tonal quality managed to develop the ability to dull their perception of needle scratch. Others, less fortunate, simply gritted their teeth and put up with it for the sake of being able to appreciate the full harmonic structure of the music. A large portion of the public rotated the tone control, bought cactus needles, and developed a preference for limited range reproduction.

With well designed sharp cut-off filters, very lightweight pickups, and elaborate precautions in protecting records, some owners of high quality equipment were able to effect a reasonable compromise. At various times it was believed that volume expanders, plastic pressings, pre-emphasis, and similar methods would bring about satisfactory listening conditions. The volume expanders turned out to be easier to design and operate in the laboratory than in practical applications. Furthermore, they failed notably to reduce sharp clicks and abrupt transient noises, and were limited in other respects to be discussed later. Plastic pressings eliminated the usual steady hiss typical of abrasive filled shellacs, but in addition to other troubles they developed electrostatic charges that attracted dust and dirt to produce a crackling background often more irritating than the steady hiss. Pre-emphasis is practiced by

almost all record manufacturers, but to achieve optimum results considerable more coordination is required between recording and playback curves than has been possible except in radio broadcast applications. Even then the noises introduced by the accumulation of dust and by various factors of wear and handling are not lowered sufficiently during quiet musical passages.

The signal-to-noise ratio from recorded music varies almost continuously. Most of the noise, both from low frequency rumbles and from high frequency needle scratch, is approximately constant in magnitude. The music signal may vary from actual zero to very high levels. During full orchestral passages the signal-to-noise ratio is very large and the noise is effectively masked by the music. At any instant during the playing of a record, there is a specific bandwidth that will provide optimum signal-to-noise ratio. In general, it would be desirable to pass everything flat within that band and attenuate all other frequencies abruptly. The low frequency spectrum is not as critical with regard to sharp cut-off as the high end.

A noise suppressor that would produce optimum results at all times would have the following principal characteristics:

1. It would continuously and automatically adjust the bandwidth to produce optimum signal-to-noise ratios at all times.

2. The bandwidth should be controlled only by the music signal and

should not be broadened by strong noise signals.

3. The high and low frequency cut-offs should be controlled independently in terms of the requirements of the music.

4. Aural balance should be maintained.

5. The bandwidth should open rapidly enough to pass abrupt musical transients with full brilliance. It should close rapidly enough to eliminate noise during the following passage, but not so quickly as to damage the shimmer of reverberation.

6. The high frequency cut-off should be steep, and the low frequency cut-off sharper than is possible with conventional RC circuits.

7. It should be adjustable with regard to minimum and maximum bandwidth so that no portion of the extreme spectrums is ever permitted to pass under conditions where the signal contains no components in those regions. It is also desirable to be able to adjust for a minimum bandwidth with considerable attenuation of the upper fundamentals when the gates are closed during passages where no signal is present in that region and the record surface is unusually poor.

8. Harmonic and intermodulation distortion introduced by the noise suppression circuits should be negligible.

9. The operation of the dynamic control should introduce no audible thumps or other observable evidence of its action.

The Dynamic Noise Suppressor circuits developed by Hermon Hosmer

RADIO NEWS

Scott represent the only known method by means of which all of these requirements may be fulfilled.

The basic principles involve the use of controlled reactance tubes as components of correctly designed high and low pass filter sections. A capacitive-reactance tube circuit is shown in Fig. 3A. The shape of the I_p/E_s curve is largely controlled by the screen grid voltage which is set by the voltage divider R_2/R_3 . The operating point for a given screen voltage is set by the cathode potentiometer R_1 and the negative voltage applied to the grid. Thus, the effective mutual conductance of the tube may be controlled by varying either of these values. C_1 is a blocking condenser. C_1 and R_1 form a frequency sensitive phase shifting voltage divider connected so that the percentage of the signal voltage passing through the circuit that is applied to the signal grid will vary directly with frequency and will cause the tube current to lead the voltage signal on the plate approximately 90 degrees. The tube now affects the circuit operation as a capacitive reactance. The capacitive shunting effect of the tube on the system with respect to frequency varies with the tuning of C_1 . It also varies with mutual conductance and is therefore controlled by screen voltage, cathode bias, and grid voltage.

A similar circuit is shown in Fig. 3B, except that the phase shifting voltage divider in the plate-to-grid circuit causes the tube current to lag the plate signal voltage by 90 degrees. This causes the tube to appear as an inductive reactance with a corresponding high pass filter effect on the system.

Fig. 4 shows a relatively simple version of the Dynamic Noise Suppressor applicable to moderately priced radio-phonographs. The effective Q of the filter circuits is controlled by the value of fixed cathode resistance in the reactance tube circuits, and will vary with the type of tube used and the results desired.

The input signal is amplified by V_1 and a portion of it applied to the filtered rectifier circuits operated with the diodes in the same tube envelope. A portion of this voltage is filtered so as to contain only components of the signal from the upper middle section of the fundamental musical scale. The d.c. voltage resulting from this rectified portion of the signal is applied to the grid of the capacitive reactance tube. This voltage tends to decrease the mutual conductance of the tube, thus effectively tuning it to a higher frequency.

The portion of the spectrum which contains the largest amount of irritating high frequency noise is above the highest fundamental note in the musical scale. Any musical energy in this high frequency spectrum must be a portion of the harmonic structure of a fundamental in the middle high range. Thus the filter circuits for the control voltage are designed so that whenever fundamentals are present containing high frequency harmonic

structures, the reactance tube is driven toward cut-off. On the other hand, noise energy in the harmonic spectrum is filtered out of the control circuits and cannot affect the reactance tube. Furthermore, these bandpass control circuit filters eliminate low frequency signals that do not contain appreciable harmonics in the range above 4000 or 5000 cycles per second. Thus the high frequency reactance tube cannot be "driven open" unless there is music present to mask the noise and increase the effective reproduction range.

This capacitive reactance tube is designed as a portion of the series LC circuit so that a very sharp cut-off filter is achieved.

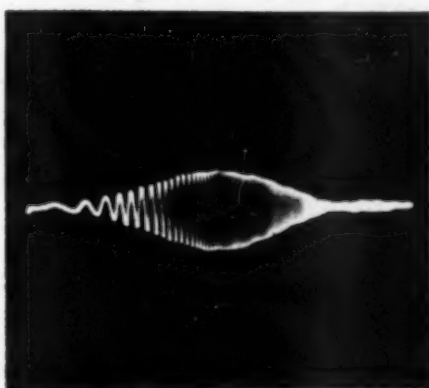
The filters that apply d.c. control voltage for the low frequency inductive reactance tube are designed to obtain their energy from a region just above the attenuated section. This tube is controlled by the harmonic structure of the fundamentals in the low frequency region. Most low frequency rumbles do not contain appre-

ciable harmonic structures and cannot "drive open" the low frequency gate. A bass drum, however, has the broadest harmonic structure of any instrument in the orchestra, and other low frequency music signals contain appreciable energy in the control bandwidth. High frequency energy is eliminated so that upper fundamentals will not drive the low frequency reactance tube when no music energy is present in the bass region.

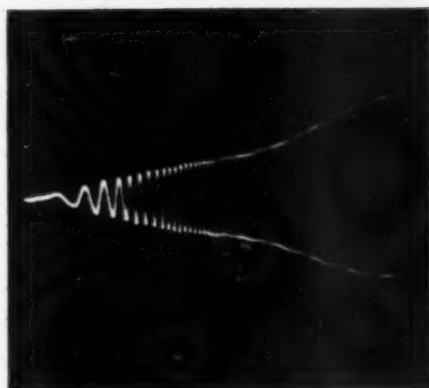
This principle of design, where the bandwidth is determined by sections of the spectrum outside of the controlled portions, is of basic importance in successful operation. This is one of the reasons why the selective volume expander circuits for noise suppression (even though both high and low frequencies are controlled) are unsatisfactory and will not suppress transient clicks and pops such as those occurring with plastic record surfaces.

Noise suppressors may be divided into two broad categories. One type varies the amplitude of the total signal in the entire spectrum or in a

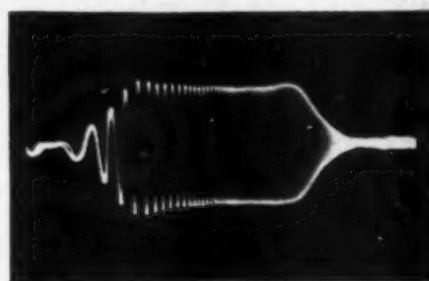
Fig. 2. Actual photographs of oscilloscope patterns show operation of the Scott noise suppressor. A 50-15,000 cycle sweep generator was used. (A) Gates partially closed. (B) Maximum suppression, gates fully closed, plus roll-off. (C) Maximum high frequency attenuation and maximum low frequency boost. (D) Maximum high frequency boost and maximum low frequency attenuation. (E) Maximum high and low frequency boost. Note gates inoperative in C, D, and E.



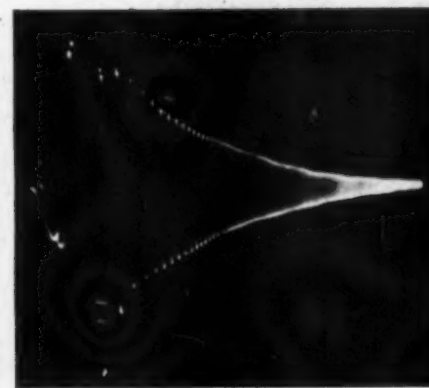
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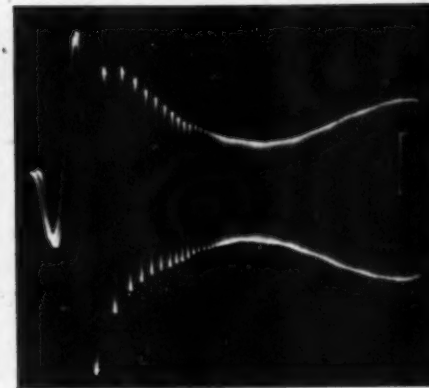
D



A



C



E

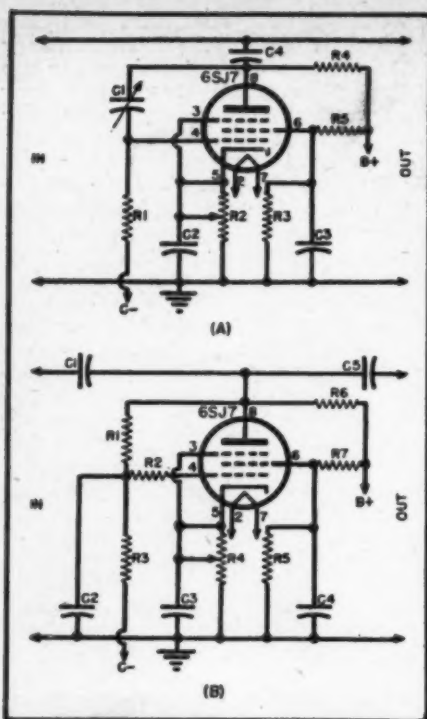


Fig. 3. (A) Capacitive-reactance tube circuit. (B) Inductive-reactance tube circuit.

large block of the upper or lower ranges. The Dynamic Noise Suppressor under discussion is of the "horizontal" type, functioning to vary the bandwidth rather than the amplitude of the signal. There are many ad-

vantages of this method over any other.

It is important to realize that the so-called high and low frequency "gates" are continuously varying in the Dynamic Noise Suppressor. In actual operation the cut-off frequency at each end of the spectrum is constantly changing to adapt the bandwidth to the requirements of the signal. In maximum conditions of suppression the minimum bandwidth may be limited to as little as approximately two octaves of the musical scale.

In the circuit shown in Fig. 4, a fixed filter consisting of a parallel LC circuit is shown in series with the high side of the system. This filter eliminates response from the very high frequency regions where no signal is available from disc recordings. It may be tuned in versions, such as the one illustrated, to 10 kc. and thus serve a dual purpose by eliminating heterodyne whistles when the suppressor is used in a radio receiver channel. In the very wide range systems it is tuned to 15 kc. or higher.

In elaborate versions of these circuits it is sometimes desirable to provide great flexibility of control. Each designer of equipment incorporating Dynamic Noise Suppression circuits must determine this in terms of the application. It is possible to introduce a great many variables in special switching arrangements to vary the speed with which the gate circuits open and close, the portion of the input signal applied to the control volt-

age sections, the tuning of the fixed high frequency filter, and innumerable other facilities. As a practical matter, a maximum of two panel controls are adequate to adjust the circuits for satisfactory results from almost any type of program material. For purposes of the average user it is desirable to keep controls at a minimum. Most people want to own machines that simply produce high quality music. They are often frightened, rather than impressed, by equipment with control panels comparable to the cockpit of a B-29.

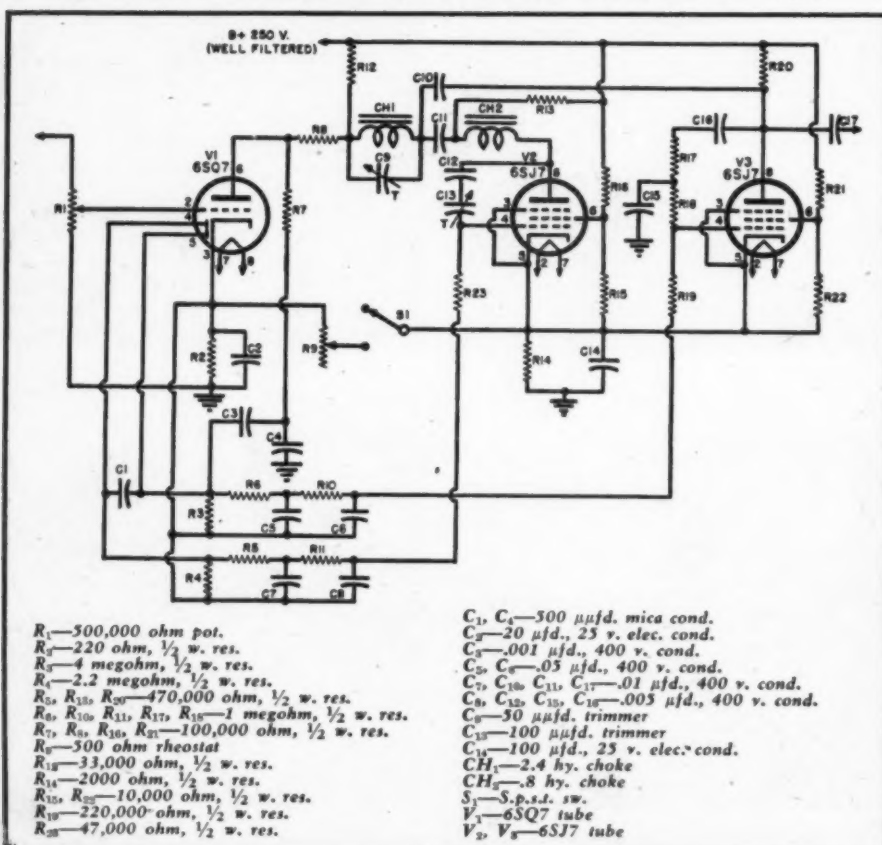
In table model sets where the low frequency response is sufficiently attenuated in the inherent design of the circuits and acoustic limitations, it is sometimes possible to use only one reactance tube of the capacitive type to reduce needle scratch and still obtain reasonably satisfactory results. In high quality equipment it is essential to use at least one high and one low frequency gate. This is partially true because the presence of low frequency noises becomes more objectionable when the high frequency noise is removed. It is also imperative because the aural balance will be impaired under conditions of high frequency suppression if the low frequencies are not attenuated. It has become an accepted principle that the ear recognizes a correct aural balance as being more satisfactory than extreme extension of one end of the frequency spectrum without the other.

It is not possible to control a single reactance tube in such a manner as to tune it over the entire range it may be desirable to reproduce. For this reason the more elaborate versions use two high frequency reactance gate circuits. One of these is tuned to handle the upper fundamental and lower harmonic range, and the other designed to operate in the range of upper harmonics.

It is possible to obtain excellent results with the Dynamic Noise Suppressor in equipment containing no other frequency response controls. The suppression of noise is not the only function of tone controls, and it is desirable to have such facilities available in addition to the noise suppressing circuits. In the design of the amplifier shown in Fig. 1, circuits have been included to provide continuously variable attenuation or emphasis of the high and low ends of the frequency spectrum. Many circuits may be used for this purpose, but well designed RC networks have a number of advantages. Fig. 2 shows several oscilloscope patterns of frequency response made under various conditions of operation. The input signal is obtained from a Clough Brengle Audiomatic Oscillator with a 50 to 15,000 c.p.s. sweep. The gate circuits can be shown only under static conditions, which is not an adequate indication of the results obtained in actual operation.

There are a number of secondary advantages obtained with horizontal
(Continued on page 162)

Fig. 4. Simplified circuit of dynamic noise suppressor. Values given are typical for tubes used. Tubes, such as the 6SK7 and others, require adjusted values for optimum results. More elaborate switching is often used in units of this type.



R_1 —500,000 ohm pot.
 R_2 —220 ohm, $\frac{1}{2}$ w. res.
 R_3 —4 megohm, $\frac{1}{2}$ w. res.
 R_4 —2.2 megohm, $\frac{1}{2}$ w. res.
 R_{5A} , R_{5B} , R_{5C} —470,000 ohm, $\frac{1}{2}$ w. res.
 R_{6A} , R_{6B} , R_{6C} , R_{6D} —1 megohm, $\frac{1}{2}$ w. res.
 R_7 , R_8 , R_{9A} , R_{9B} —100,000 ohm, $\frac{1}{2}$ w. res.
 R_{10} —500 ohm rheostat
 R_{11} —33,000 ohm, $\frac{1}{2}$ w. res.
 R_{12} —2000 ohm, $\frac{1}{2}$ w. res.
 R_{13} , R_{14} —10,000 ohm, $\frac{1}{2}$ w. res.
 R_{15} —220,000 ohm, $\frac{1}{2}$ w. res.
 R_{16} —47,000 ohm, $\frac{1}{2}$ w. res.

C_1 , C_2 —500 μ fd. mica cond.
 C_3 —20 μ fd., 25 v. elec. cond.
 C_4 —0.01 μ fd., 400 v. cond.
 C_5 , C_6 —0.5 μ fd., 400 v. cond.
 C_7 , C_{10} , C_{11} , C_{12} —0.1 μ fd., 400 v. cond.
 C_8 , C_{13} , C_{14} , C_{15} —0.05 μ fd., 400 v. cond.
 C_9 —50 μ fd. trimmer
 C_{16} —100 μ fd. trimmer
 C_{17} —100 μ fd., 25 v. elec. cond.
 CH_1 —2.4 hy. choke
 CH_2 —8 hy. choke
 S_1 —S.p.s.t. sw.
 V_1 —6SQ7 tube
 V_2 , V_3 —6SJ7 tube

THERMISTORS—

A New Electronic Component

Being extremely sensitive to temperature variation, these resistors will find many applications in the electronic industry.

By FRANK E. BUTLER

HOW efficiently electronics fits into today's requirements of industry and the home depends in large degree on the use of simple and reliable techniques by means of which physical energy can be automatically detected, measured, utilized, and controlled economically.

The progress made in past years in the development of electronic control devices and their continued use, as applied to the broad anticipated requirements of the future may prove both cumbersome and costly. One such means of providing a simplified approach to such problems is a group of sensitive control elements known as "Thermistors"—developed by The Bell Telephone Laboratories—which are proving adaptable to a wide range of industrial uses.

Thermistors, in comparison with devices they are designed to replace, are small, inexpensive, flexible in application, require little servicing, have long life and are suitable for use with either a.c. or d.c. current.

Thermistors—or thermally sensitive resistors—are a new type of circuit element in which electrical resistance varies widely with changes in temperature. They are made of a class of materials known as semi-conductors, that is, materials whose conductivity lies between that of conductors and insulators, a basic distinction of which lies in their extreme sensitivity to relatively minute thermal manifestations. Some of these uses are as time delay devices, protective items, voltage regulators, volume limiters, test equipment for ultra high frequency power, and detecting elements for very small radiant power. Because of these and other desirable properties Thermistors promise to become new circuit elements which will be used extensively in fields of communication, radio, electrical and thermal



A group of Western Electric Thermistor units enclosed in metal cans. In some applications, such as automatic gain control in amplifiers for the K-2 telephone carrier system, it is necessary to compensate for variations in ambient temperature. In such cases, Thermistors are built into networks which are designed in such a way that as the ambient temperature increases, the amount of current sent through the heater of Thermistor tube is reduced by just enough to compensate for any changes in temperature of the bead. These networks are inserted in cans, as shown, which are then filled with sand and sealed with special wax.

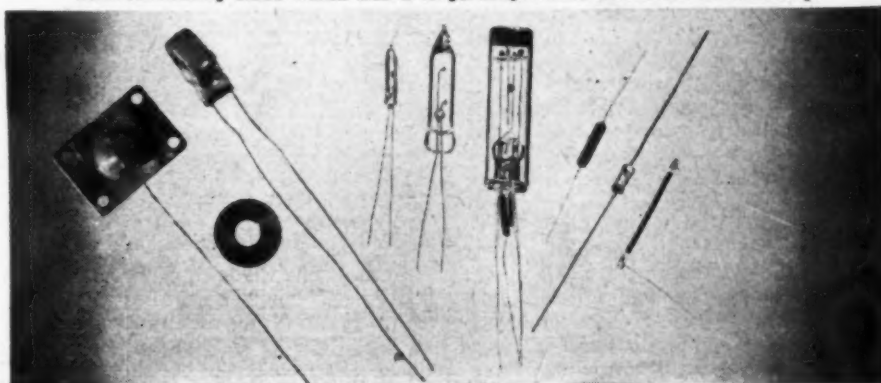
instrumentation, research in physics, chemistry and biology.

Thermistors are made in three main types—discs, rods and beads, all with the same basic methods. The materials of which they are composed, manganese, nickel, cobalt, copper, uranium and other oxides, are milled and mixed in various proportions to provide specific resistance vs. temperature and other characteristics desired for

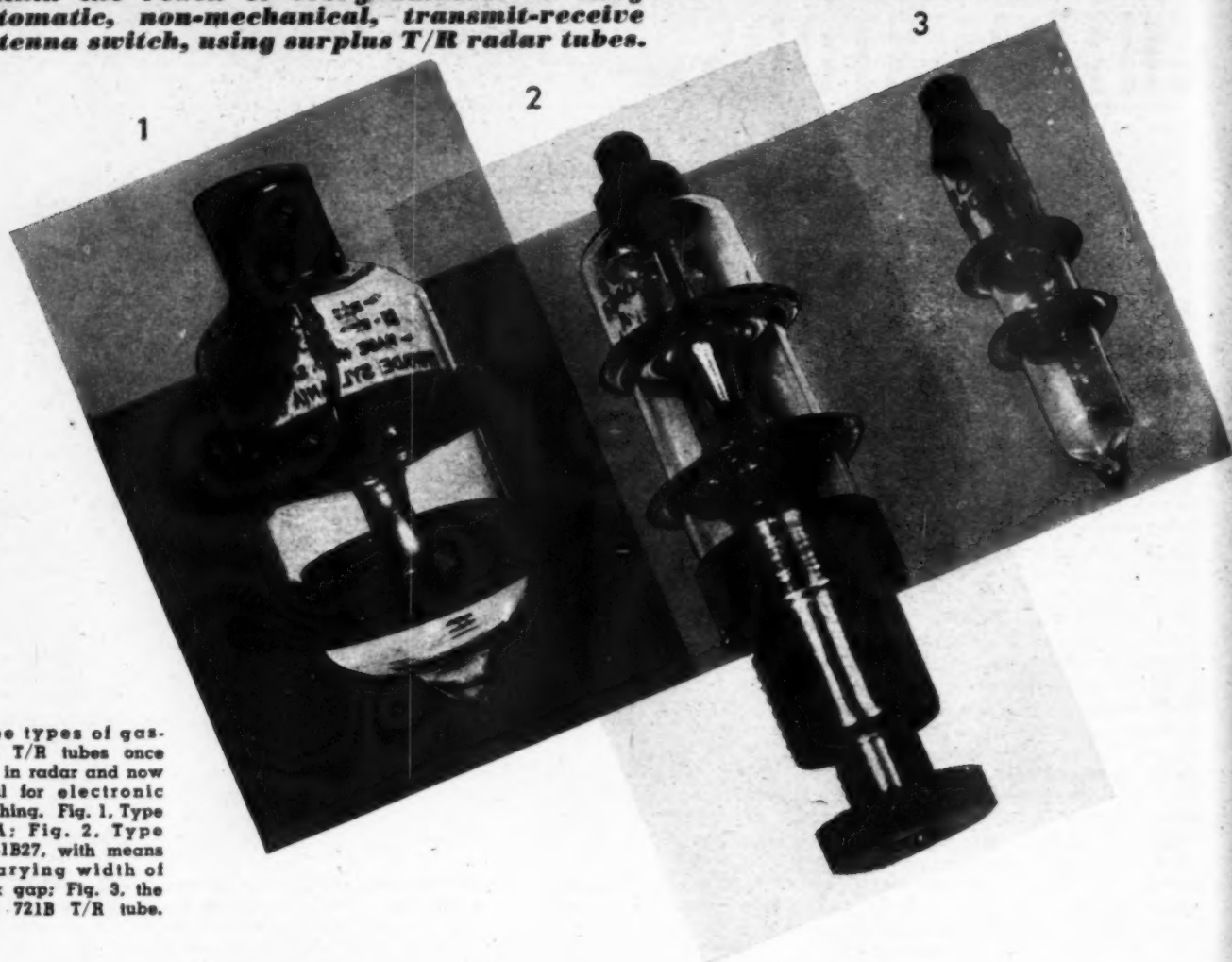
particular applications, then formed into the shape wanted and lead wires attached thereto. Firing under accurately controlled temperature and atmosphere conditions results in a hard ceramic product which may be mounted in a variety of housings depending upon mechanical, electrical, and thermal requirements. Tests on numerous types extending to more

(Continued on page 154)

Different types of W.E. Thermistor units of which over thirty variations of the prototype are now being manufactured. The photograph shows the pressed disc type, the bead type, and the extruded rod type. The essential component is a semi-conducting oxide which has a large temperature coefficient of resistivity.



Within the reach of every amateur—a fully automatic, non-mechanical, transmit-receive antenna switch, using surplus T/R radar tubes.



Three types of gas-filled T/R tubes once used in radar and now useful for electronic switching. Fig. 1, Type 724A; Fig. 2, Type 1B24-1B27, with means of varying width of spark gap; Fig. 3, the Type 721B T/R tube.

ELECTRONIC SWITCHING for the Ham Antenna

By TOM GOOTÉE

USE of a single antenna for both transmitting and receiving requires some sort of switching device which connects the transmitter to the antenna during actual transmission and connects the receiver to the antenna at all other times.

The simplest method is a mechanical or manually operated switch, but this too often proves unsatisfactory for rapid operation. Even so-called "automatic" relays fail to work on occasion, particularly for bug operation. Poor relays may create interference due to contact "chattering"; good relays are expensive, and even then not always free from trouble.

A method of economical and efficient switching, however, is by means of one

or two gas-filled diodes with certain sections of transmission line—all of which constitutes an *electronic switching circuit*.

This new field of investigation is based on the same war-developed switching principles used in radar equipment. In fact, ham switching circuits can be constructed using the same precision radar tubes. These T/R tubes have only recently been made available as war-surplus items.

Basic Circuit

A gas-filled diode or T/R tube is essentially a spark gap. It constitutes an open circuit until application of a sufficiently high voltage—known as the *striking voltage*—produces an arc,

due to ionization, and thus becomes an effective short circuit. Removal of voltage from the two electrodes stops current conduction and eliminates the short circuit.

When used in the basic switching circuit (Fig. 4A), the tube is placed across the receiver branch of the output transmission line, one-quarter wavelength from the junction point.

This is only true when open wire line is used. In the event that coax line or the popular twin lead is used, it will be necessary to multiply the calculated length by the velocity propagation constant of the line used. For coax line with polyethylene insulation the factor is 0.65. The factor for the twinlead lines are 0.82, 0.77, and 0.68 respectively, for 300, 150, and 75 ohm types.

During operation of the transmitter, the output voltage sustains an arc between the two electrodes of the diode. This short-circuits the receiver input. Since the diode is placed one-quarter wave length from the junction point, the short circuit appears as an open

circuit (or very high impedance) at that point.

When the transmitter is not in operation, there is not sufficient voltage in the circuit to sustain an arc and the diode becomes an open circuit. Received signals from the antenna approach the junction point and have a choice of two paths; to the receiver, and to the transmitter. In most cases, where the output of the transmitter is properly matched to the antenna system, the output impedance of a quiescent transmitter is considerably greater than its impedance during operation. Thus, the signal passes to the input of the receiver.

For the above reason, the distance d (Fig. 4A) is only approximately one-half wavelength, since it must be adjusted for each installation so that the relatively high impedance of the quiescent transmitter appears at the junction point. In order to provide optimum receiving conditions, the distance d must also be re-adjusted after any change in the tuning of the transmitter.

The resistance of a switching tube during conduction will depend upon the type of tube used in the circuit, and often the resistance of two tubes of the same type may be different. For this reason, re-adjustment of the tube position along the feeder line may be in order.

During conduction there may be some leakage around the switching tube, particularly when used in high-power circuits. Ordinarily this leakage is infinitesimal and incapable of damaging the receiver, but it can usually be eliminated by adjusting the length of transmission line between switching tube and receiver to a more critical, resonant value.

Another Circuit

The output impedance of some transmitters may not always increase sufficiently during quiescent periods to make the resonant line (distance, d) effective in blocking received signals. Also physical limitations of the ham shack may prevent or make difficult such a long installation. In either case, a variation of the previous circuit can be employed (Fig. 4B) using two gas-filled diodes of the same type. Addition of the second tube A provides greater economy of input power from the antenna during reception only. Diode B operates in the same manner as previously described.

During transmitter operation, voltage in the output circuit strikes both gaps simultaneously. The short circuit caused by diode A is reflected back as a high impedance. Since this very high impedance is in parallel with the low impedance of the main transmission line, diode A takes very little power for operation and serves no particular function during transmitting periods.

When the transmitter is not in operation, however, this tube represents an open circuit. A shorting bar placed one-quarter wavelength beyond diode A is reflected as a short

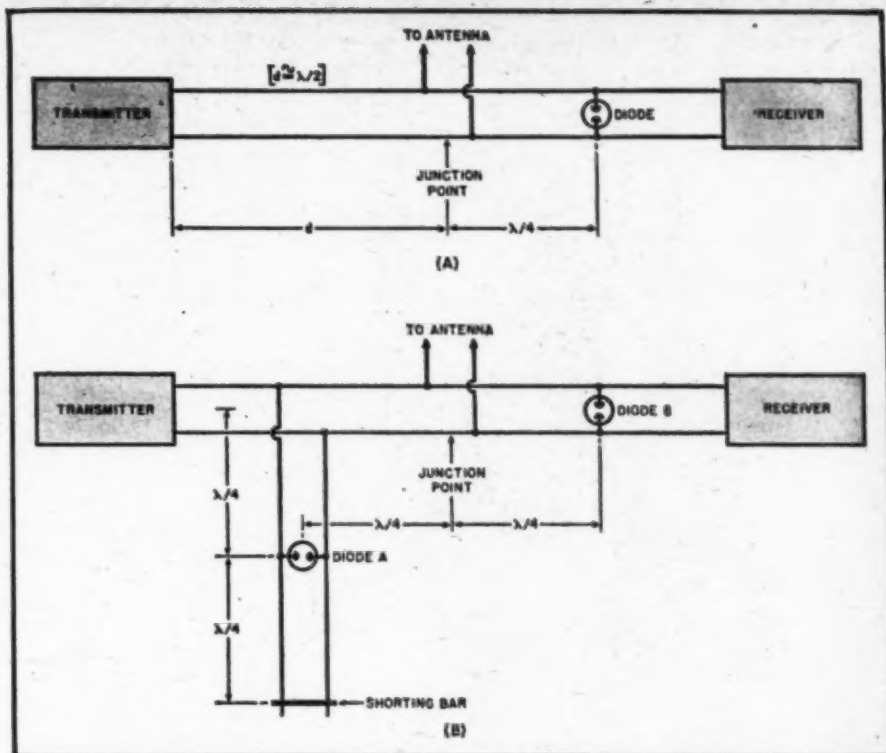


Fig. 4. (A) Basic one-tube T/R switching circuit, (B) improved circuit using two tubes.

circuit across the main line from transmitter to antenna. This short circuit, in turn, is reflected as a very high impedance at the junction point. This effectively blocks the entry of received energy (from the antenna), and the entire signal reaches the receiver.

Although the transmitter and the

diode-A-branch are in parallel, there is no undesirable reaction present because the transmitter is across an apparent short circuit. The need for any special matching stubs, or a line stretcher, is eliminated, since any changes made in the transmitter affect only the impedance in parallel

(Continued on page 112)



Fig. 5. This 1B32/532A gas-filled spark gap was once used in Signal Corps' largest radar set—it can now be obtained for electronic switching of amateur-type antenna systems.

A TEN-METER CONVERTER



Side view of home-built converter. Antenna input terminals are shown mounted on the chassis flange.

By **GEORGE F. MASIN**

Ideal for use with war-surplus receivers—this converter features novel input and output circuits.

ALTHOUGH there have been many converters described for the ten-meter band, many of these have been difficult to adjust, or have used parts not readily available. The converter to be described, has several features which to the writer's knowledge have not previously been published. Some of these features have been described in various engineering texts, but have not been covered in terms of practical application.

Among the innovations to be described are:

1. A "grounded grid" regenerative triode r.f. amplifier, which gives a gain of 4 to 5 over the entire band, yet does not require an additional tuned circuit or tuning controls, such as an extra condenser in the tuning gang.

2. A balanced input circuit which reduces r.f. and noise pickup from the lead-in to a minimum.

3. The use of a triode r.f. amplifier and triode first detector results in the best possible signal-to-noise ratio that

may be obtained at these frequencies.

4. A high gain stage of i.f. amplification (6AC7) which assures ample signal input into the most mediocre broadcast-band receiver, and provides the additional selectivity of two tuned circuits ahead of the broadcast receiver's antenna input circuit.

5. The relatively simple tuning circuits which necessitate no particular care in regard to either stage shielding or bypass condensers, since no two circuits operate at signal frequency.

The antenna for which the converter is designed is a folded dipole which covers a relatively broad band and comprises the input system of the converter. As can be seen from the diagram, this antenna consists of a section of 300-ohm line cut to 14½ ft. with shorted ends. The 300-ohm lead-in is taken from the broken center of either one of the twin leads comprising the antenna.

Normally the grid of a grounded

grid amplifier, which in this case is a 6C4 triode, would be grounded directly, resulting in more complete isolation and screening of the input circuit from the output circuit. However, it can be shown (1) that this type of amplifier can be made somewhat regenerative and the gain can be increased, theoretically, two times over the plain grounded grid amplifier by feeding the grid out of phase with the cathode.

This is accomplished by feeding one side of the balanced 300-ohm line into the grid, the opposite leg of the line being fed directly to the cathode of the 6C4. The grid and cathode circuits are closed, as far as d.c. is concerned to ground, through the 750 ohm resistors.

It can be seen that any noise picked up by the line will actuate both grid and cathode in phase, resulting in no amplification. However, for signal inputs from the antenna, the r.f. grid voltage is 180° opposite in phase to that fed into the cathode, resulting in maximum amplification of the desired r.f. signal.

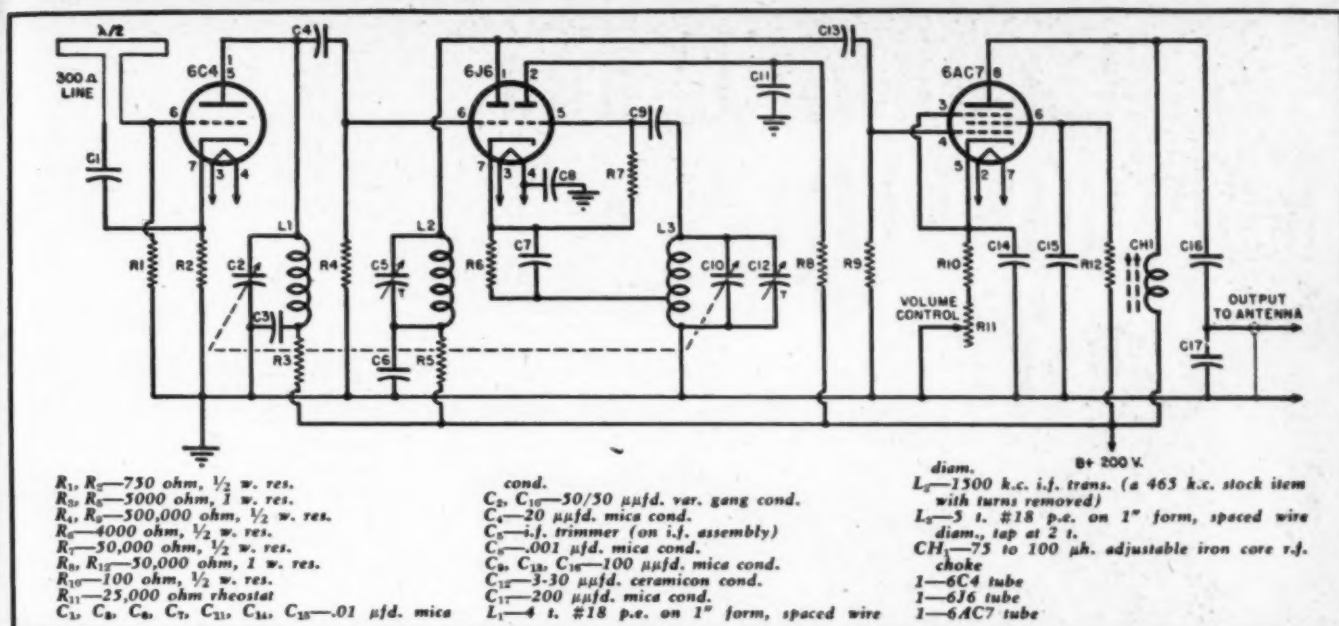
The plate circuit of the 6C4 is tuned to signal frequency by one section of the variable condenser and coil L_1 . The r.f. voltage developed across this circuit is capacity-resistance coupled to the grid of the first detector section of the 6J6 twin triode, the plate of which is tuned to 1500 kc.

The 1500 kc. i.f. transformer was constructed by removing approximately ¾ of the turns off one winding of a discarded dual-tuned 465 kc. i.f. unit. As an experimental check on the frequency of this transformer, it may be connected in series with the antenna connection of a standard broadcast-band receiver, tuning the receiver to a 1500 kc. station and noting if, when the modified i.f. unit is adjusted, the 1500 kc. station can be attenuated. If this condition is obtained, the unit will be satisfactory. If the constructor has the facilities of an inductance bridge available, he can adjust the i.f. coil to an inductance of 120 to 130 microhenries.

The output circuit of the i.f. amplifier is tuned to 1500 kc. by a parallel resonant circuit comprised of an adjustable iron-core r.f. choke coil, CH_1 , which is shunted by a 100 micromicrofarad condenser in series with a 200 micromicrofarad condenser. This series combination comprises, with the tuned output circuit, a pi-matching section which matches the plate circuit of the 6AC7 to the average broadcast-band receiver input, and tends to reduce the amplitude of harmonics which might be generated in the converter.

Actually, if a three foot or longer piece of low loss shielded cable is used for the output connecting cable, the 200 micromicrofarad condenser may be omitted. This is true only if the shielded cable is used.

The oscillator circuit is the conventional grounded plate Hartley or electron coupled oscillator. It may be noted that the grid bias resistor re-



Schematic diagram of 10-meter converter. Power for operation may be obtained from receiver.

turns to cathode; thus the only bias voltage obtained on the oscillator grid is that supplied by its own grid current.

Plate current for this section will be approximately 1.5 ma. if the oscillator is functioning and can be measured by the drop across R_8 , without upsetting the circuit. Normal drop across this resistor will be 75 volts.

Bias for the first detector is obtained through the resistor R_8 , which is bypassed for signal and i.f. frequencies by condenser C_1 . This resistor and condenser connect to the tap on the oscillator coil, obtaining feedback voltage for the oscillator section of this tube and injection voltage for the mixer or first detector section, since the cathode is common to both triode sections. Bias on the first detector is near the cut-off value, with the oscillator not functioning. To obtain this condition 4000 ohms was chosen as cathode bias resistor.

It can be shown (2) that the output of the first detector will be greatest if the tube is operated so that the oscillator signal will drive the tube beyond cut-off on the oscillator voltage negative half-cycle and drive the plate current up to maximum during the positive oscillator half-cycle.

The oscillator signal must not actually drive the grid of the first detector positive, however, for this would result in a low input grid impedance, which would, in effect, be shunted around the r.f. tuned plate circuit.

The i.f. amplifier is conventional, though capacity-resistance coupled. Care should be exercised to return all grounds from the cathode, screen, and plate bypass to one common point. The cathode gain control keeps this stage from overloading and adjusts the input into the receiver.

The total plate current consumed is approximately 20 ma. at 200 volts. The current requirements of the 6.3

volt heater supply is 1.05 ampere.

The average better house radio or auto radio can usually be counted upon to supply the additional drain for short periods of time without unduly overloading the power transformer or high voltage supply.

The procedure for adjusting this converter is standard for a superheterodyne. The output terminals should be connected to the receiver to be used, and the receiver tuned to a clear spot between 1500 and 1600 kc. Condenser C_2 in the i.f. can, and the iron slug in CH_1 , should then be peaked for maximum noise in the receiver.

With the converter tuned near the high frequency end of the ten meter band, the trimmer condenser, C_{21} , should be adjusted until signals are heard. The over-all range of the converter should then be checked, and should be approximately 24 to 32 mc.

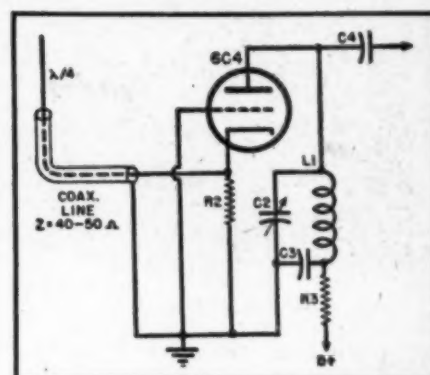
In the event that the converter is used in conjunction with an auto radio for mobile operation, it will be necessary to employ the input circuit shown on this page, if the usual quarter-wave antenna is used.

This permits the use of an unbalanced input antenna. It would probably be good insurance to place a .002 μ fd. condenser between the antenna lead and R_2 , to prevent the loss of bias on the 6C4 in the event of the antenna shorting.

A word concerning results. Using a standard six tube table model "jallop" here in Long Beach, Calif., on numerous occasions all districts have been heard in as little as five minutes' time. In addition, many V. E. Canadian stations have been heard at QSA-5R-9 plus.

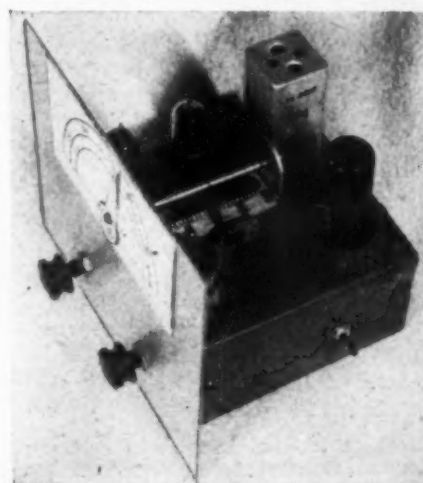
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- "Communication Engineering"—Everitt—Chapter XIII.



Schematic diagram shows input circuit of 6C4 r.f. amplifier as it should be wired when converter is used for mobile operation. This same type of input circuit should be used with any type of unbalanced antenna circuit.

Photograph shows relative position of top-of-chassis components. Adjustment screw for r.f. choke (CH_1) may be seen protruding from the side of the chassis.



The RECORDING and REPRODUCTION of SOUND

Part II. Design details for building a high quality record-reproduce amplifier

By

OLIVER READ

Editor, RADIO NEWS

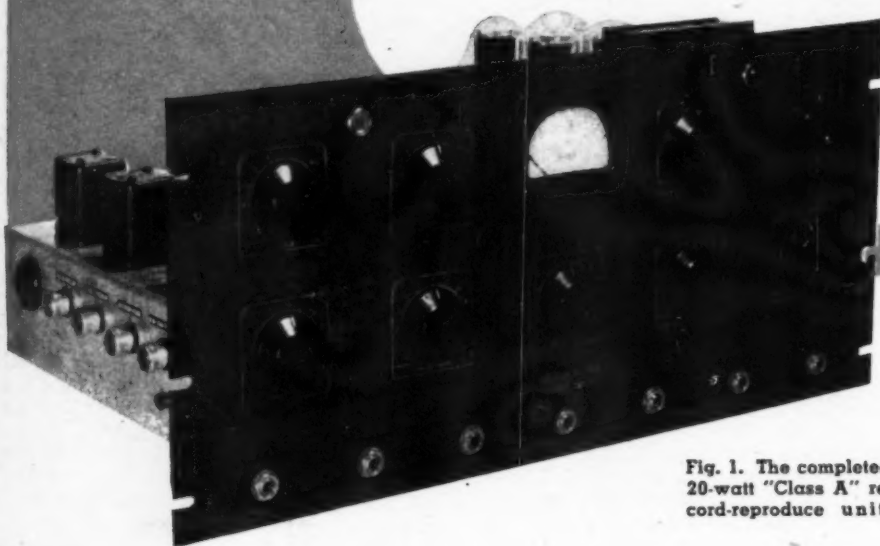


Fig. 1. The completed 20-watt "Class A" record-reproduce unit.

OPINIONS vary among engineers as to the desirability of employing beam power amplifiers instead of triode amplifiers such as the 2A3, 6A3, 6B4, etc., for high quality recording in the output stage of a power amplifier. It is not the purpose of this article to debate pro or con on this controversial subject but rather to point out the advantages and disadvantages of both amplifiers. It is the writer's personal opinion, based on actual experience, that a properly designed output stage employing the type 2A3 triode is a bit superior to the 6L6 even when the latter employs feedback in its output channel. When more than one triode is used, the system becomes even more flexible. Push-pull 2A3's, for example, in self bias operation are capable of approximately 10 watts output at low distortion. The power may be doubled by employing push-pull parallel 2A3's. There is more than one advantage to be gained from this latter arrangement as the plate impedance presented at the primary of the output transformer is reduced to a very low value. When connected to a 500 ohm cutter at the output of the transformer, a near perfect match may be realized due to the extremely low plate impedance of the primary.

Reproducing systems, too, are critical as to their loading. If a 500 ohm

speaker is used at the output for reproduction, then the 500 ohm load reflected to the low impedance primary becomes more or less non-critical. Impedance changes with frequency. The closer the match between the primary and secondary, the more non-critical becomes the loading effect. Therefore, high fidelity may be achieved at very low distortion in the output channel.

This is extremely important when driving a 500 ohm magnetic cutter.

First we will discuss a more or less conventional amplifier design which has achieved considerable popularity and is almost the unanimous choice of sound equipment designers. Beam power tubes, as was previously pointed out, are considered desirable for general purpose amplifiers but their high effective generator impedance results in relatively critical requirements with regard to load impedance. The development of degenerative feedback networks indicates a solution to this problem. If a careful choice is made in the output transformer, then it is possible to design amplifiers using push-pull 6L6's in carefully designed circuits which possess negligible intermodulation distortion. The simple amplifier illustrated in Fig. 2 employs such a design. The power output section of the circuit includes two 6L6's in push-pull.

Most manufacturers operate these tubes in Class AB, rather than in Class A. The reason for this is that the power supply may be made smaller inasmuch as less static plate current flows. The tubes may be driven harder and more output power obtained at reasonably low harmonic distortion. There is a disadvantage, however. The tubes must be carefully balanced for optimum results. Intermodulation distortion results from non-linearity and it is to be expected that any departure from Class A operation will be undesirable from this standpoint. In Class A, variations in replacement tubes are not as serious as in Class AB, operation.

It is very important that the output transformers have adequate inductance. If insufficient, this appears as a shunt reactive load. A reactive load line is elliptical and will combine with the resistive load line to produce an elliptical departure from the linearity. This reduces the undistorted power output. If required, however, a reduced primary inductance may be employed to aid in lowering the bass resonant peak characteristic of beam power tubes fed into a loudspeaker load. Under these conditions there will also be a high frequency rise. This will tend to increase the harmonic distortion percentage. As the impedance rises with frequency, it produces a greater output at harmonic frequencies than at the fundamental frequency. Feedback circuits, therefore, will aid somewhat by providing superior fidelity at the higher frequencies.

There are many types of phase inverters that provide reasonably satisfactory results. The one employed in this circuit is perhaps the most popular. The principal disadvantage in such

a circuit is that the tube stage offers very little gain. This must be compensated for by additional gain in other stages. The difference between the plate circuit-to-ground and the cathode circuit-to-ground shunt capacitance is not the same. This will introduce some unbalance at frequencies above 6000 cycles. However, phase shift problems are greatly minimized and the stability of this circuit is excellent.

A disadvantage of this circuit is that the high cathode-to-filament voltage may introduce some problems that preclude the use of this phase inverter in stages preceding the driver. It is recommended that a resistor of approximately 50,000 ohms for the plate and cathode loading resistors be used. The lower values keep the cathode-to-filament voltage low. The resistors shown in series with the two grids of the 6L6's are not found, as a rule, in commercial amplifiers. They do, however, aid in decreasing tendencies toward oscillation and provide a slight cushioning effect when the 6L6's are driven close to the grid current region.

There is no bypass condenser used across the cathode resistor of the 6J5 phase inverter. The usual bypass should be omitted in order that no hum be introduced in the stage.

It is desirable to use a feedback voltage from one of the plates of the 6L6 or from one of the taps on the winding of the output transformer, if a single-ended amplifier is to be used. It should be pointed out that in such applications feedback in this section of the amplifier should never be used for frequency compensation or for the elimination of hum or distortion which usually results from careless design. Any amplifier should always be constructed without any feedback and adjusted for lowest possible hum and proper performance before any additional circuits are added to introduce any form of feedback. The principal advantage in such a stage is to help to adjust the impedance actually presented by the loudspeaker. Feedback in such circuits will tend to clear up whatever distortion and inherent noise remains. This, however, should be accepted as a secondary advantage and not as a principal design factor.

It is far better to run the feedback from one of the taps on the secondary of the output transformer. Excessive feedback is a bad condition and can only be corrected by cut-and-try by moving the feedback connection to a point of lower output voltage. For the initial adjustment, for choice of feedback components, the amplifier should be run in its normal condition for some time and carefully studied. Then an input voltage from a signal generator should be applied to produce a sufficient signal output for convenient measurement. The secondary remains opened during this test. The voltage is measured directly across the open leads of the secondary of the output transformer. Later a resistance corresponding to half of the correct

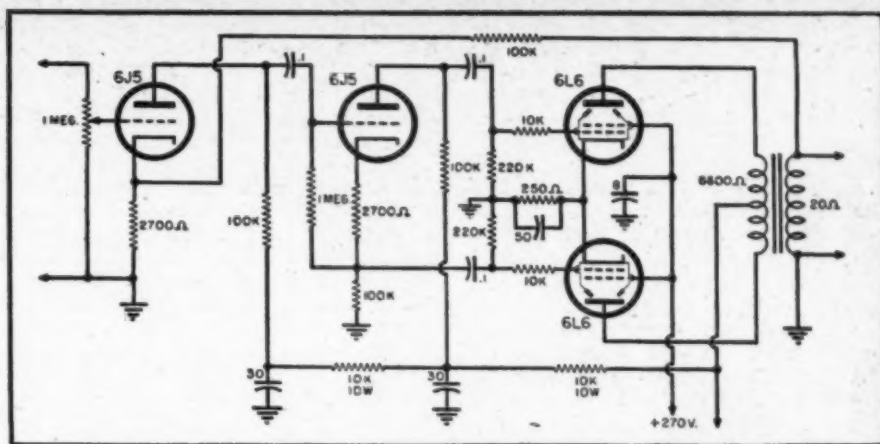


Fig. 2. The 6L6 push-pull amplifier of proven value and good design.

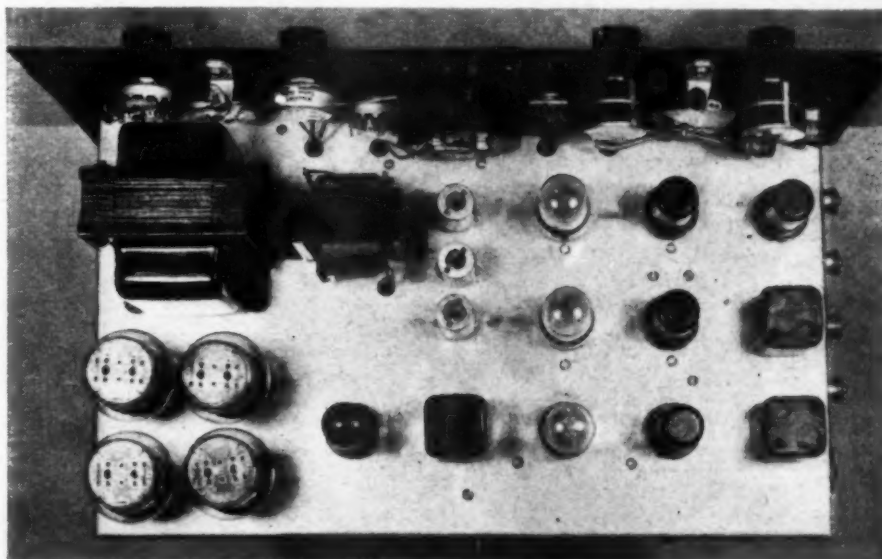
speaker load is applied across the output terminals without changing the input signal. The resulting reduced output is measured on the meter. Usually the voltage will be approximately one-fourth or even less when the resistive load is added. The next step is to take a resistor of approximately 50,000 ohms and insert this in the circuit. By cut-and-try the point will be found where not only is the volume reduced but distortion and other inherent noises will be found to clear up considerably. The ear is the best judge of the correct tap or value of series resistance to be used. When properly adjusted, the actual effective impedance as seen by the speaker will be half of the speaker's nominal impedance. Inasmuch as the turns ratio is a fixed value, the load reflected into the primary of the transformer remains at the desired value.

Note that the use of feedback as a frequency equalizing media is entirely satisfactory in voltage gain stages. However, in the power output stage, the primary purpose of feedback is to stabilize the circuit with regard to variations in speaker or cutter impedance with frequency. We may also

take the feedback from the 500 ohm tap of the secondary of the transformer. As mentioned previously, the only rule of thumb for satisfactory operation is to select a tap or voltage point where results are most pleasing to the ear. If too much voltage is taken from an output circuit, oscillations will occur and serious distortion will result. The only solution is to find a point where a lower voltage is present.

We have described briefly a simple circuit employing beam power tubes in the output. It has been the author's experience that when designing an amplifier specifically as a combined record-reproduce unit that an advantage is had by employing triodes in the output stage. Many engineers will argue against this choice but we herein present a design which we feel meets all of the necessary requirements of a good high fidelity recording system. It is foolproof in operation and, while a bit costly to produce, it is capable of performing in continuous duty and offers extremely low distortion, excellent regulation, and a flexibility that is of prime importance in any recording-playback system.

Fig. 3. Top view showing placement of principal components. The three miniatures are employed in a noise suppression circuit. See text.



The amplifier to be discussed is the result of many months of research and affords the maximum in flexibility for sound-on-disc or magnetic recording and playback.

A reserve of audio power is always needed in order to handle excessive audio peaks found in symphonic music. Lacking a reserve, no amplifier can reproduce these peaks without serious distortion being introduced.

Hum-free operation is a prime requisite in a recording system, hence the use of d.c. for the filaments of the pre-amp, mixer, and tone control tubes. The filaments are wired in series as shown and each is bypassed with a 20 μ f. electrolytic. It is advisable to wire the tubes in the sequence shown for lowest possible hum. There is no audible hum whatsoever in this amplifier with the gain controls wide open.

The complete amplifier (less power supplies) is assembled and wired on a standard 10" x 17" x 3" steel chassis.

The power supply is assembled as a separate unit and is located approximately 4 feet from the amplifier to further reduce hum pickup that might be induced by stray magnetic fields. Heavy cables and connectors provide a link for the necessary voltages.

Four separate inputs are provided. One of these is a combined pre-amp and equalizer for the *G-E* variable reluctance pickup, now widely used for high quality reproduction. Two low impedance inputs, one of 50 ohms and the other of 500 ohms, are provided. The former furnishes sufficient gain for the two *Fairchild* dynamic pickups used in this system—the latter for *Pickering*s.

A jack, *J*₂ (mounted on the patch panel beneath the amplifier), permits a standard phone plug to be inserted if other than the pickups are to be used in this channel. The author uses this position when feeding a 50 ohm *Turner* 999 dynamic microphone into the channel.

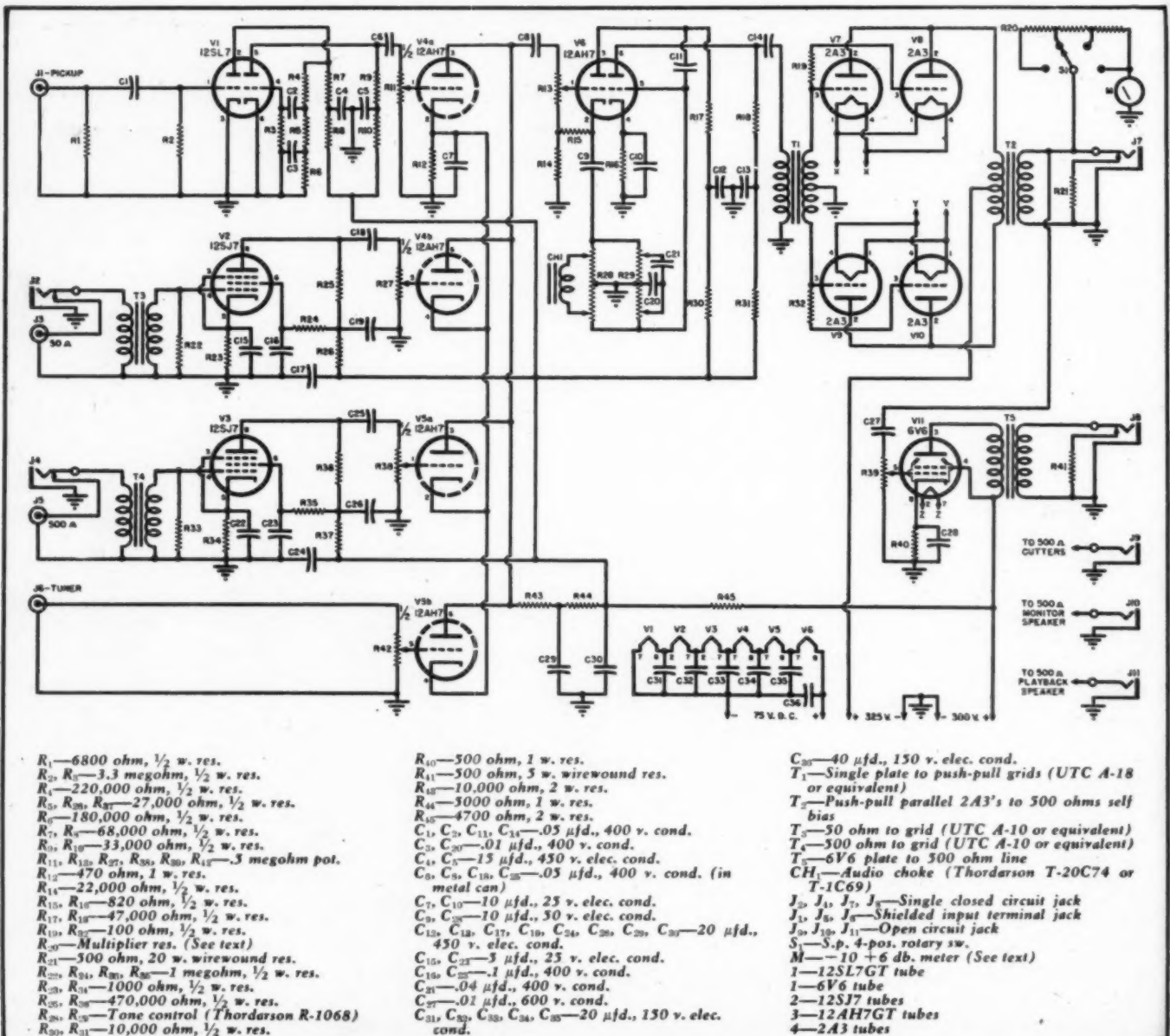
The 500 ohm input is used for two *Pickering* pickups and *J*₁ is used for feeding in a 500 ohm line, when required.

The fourth input is of lower gain and terminates in a *Browning* FM-AM tuner for off-the-air recording. Conventional crystal pickups may also be used in this channel but proper *RC* networks must be added to obtain constant velocity characteristics as described in previous chapters.

Mixing is accomplished within the four halves of two duo-triode 12AH-7's. There is no cross-talk between channels inasmuch as individual grid circuits are employed. All of the plates may be tied together and fed from a common plate load and isolating resistor network, as shown in Fig. 4.

Operation of the equalizer is based on degeneration in the cathode circuit of the first section of the 12AH7. If resistance is introduced in the cathode (Continued on page 166)

Fig. 4. Diagram of amplifier, less dynamic noise suppressor. Power supply is built on separate chassis to offset hum pickup.



TELEVISION INSTALLATION



Fig. 1. (Left) White streaks appearing in image are due to faulty ignition systems of cars and trucks passing near antenna site. Fig. 2. (Above) Effect indicates overloading of receiver input, loss of sync control, and some leakage into the video output circuit. Curvature of lines suggest that part of interference may be due to powerful nearby FM stations.

By
W. W. WAYE

Part 5. Covering the elimination of noise, or picture distortion, due to local electrical interference.

THERE are two principal types of interference likely to be encountered during a television installation, both of which influence the quality or fidelity of the received picture and also tax the patience and ingenuity of the serviceman or technician.

Multiple or ghost images, previously described, are due to the arrival at different times of identical signals from one transmitter. When present, these ghost effects differ for each television channel. They are eliminated by adjusting or reorienting the existing antenna, or by substituting a more highly directional antenna.

More of a problem, however, is a second type of picture interference—popularly known as “noise”—which consists of erratic streaking or distortion of received images on all channels, and is caused by various kinds of electrical apparatus, appliances, and similar equipment. These “noise” disturbances enter the television receiver via the antenna, lead-in, or power cord, and the result is a television picture which is flecked, spotted, or streaked—partially or wholly distorted—or scrambled into a maze beyond recognition.

Because of the many types and varieties of “noise” encountered in metropolitan and industrial locations, such installations invariably prove more troublesome than those in remote or residential districts. However, even roadside taverns and suburban buildings may prove to be

“noisy” locations. A good television installation must solve the individual problems of every location.

Confronted with the problem of “noise” interference, too many inexperienced persons are inclined to blame the location, the receiver, the antenna, or possibly all three. They should blame themselves. If the antenna, lead-in, and receiver are installed properly and otherwise operating normally, it is possible to suppress or entirely eliminate this type of interference by use of a few special techniques.

In some “noisy” locations of large cities, the work is difficult and time-consuming. But adequate television reception—free of ghosts and free of “noise”—can be accomplished with a good installation! Once again, a good installation means a personalized and individual installation—according to the type and nature of the interference problems of a particular location.

Cause and Effect

There are many sources of electrical interference, each producing different visual effects which streak, distort, or otherwise alter the television picture. Many of these effects are occasional and erratic, some are continuous and somewhat stationary, and a few have distortion “designs” that are distinctly characteristic.

As viewed on the screen, these effects may be simple (Fig. 1) or, in “noisy” locations, they may be com-

plex (Fig. 2) due to combinations of several types of electrical interference.

Some kinds of “noise” are closely associated with their source and thus have some directivity; these, somewhat like ghost interference, can be minimized or entirely eliminated by means of a highly directional receiving antenna. Other “noise” disturbances, however, affect a wide area, some of them originating from a large number of similar sources; these are the most difficult types of “noise” to suppress effectively.

Some kinds of interference can be heard on the loudspeaker, as well as seen on the picture screen. However, the sound part of a television set is relatively unaffected by many kinds of “noise,” and it is much easier to observe the effect of interference on the picture screen of the receiver.

It is important for the television serviceman or technician to become familiar with a few of the most common picture effects in order to properly and easily identify the source of many “noise” disturbances.

Random, sporadic streaks or spots (Fig. 1) are indications of faulty or “noisy” ignition systems in cars or trucks passing nearby. Similar but brighter, flashing spots or streaks—with loss of picture frame—are caused by the ignition systems of airplanes; but ordinarily this effect is brief and infrequent. This is one of the few types of “noise” interference that cannot be suppressed at its source. The best

method of elimination is to install a much higher and more directional antenna, sited as far as possible from highways and streets with heavy traffic.

Severe distortion of the television picture—usually with loss of sync control—is caused by nearby motors, gen-

erators, or other large electro-mechanical devices. Elevator motors are probably the most frequent offenders. This type of electrical interference can best be suppressed at its source.

Filters

In one typical installation (Fig. 3),

merely connecting a simple filter to the a.c. input terminals of a "noisy" elevator motor permitted adequate "noise"-free reception *which would not otherwise have been possible* from a Philco dipole-and-reflector antenna mounted within only a few feet of the actual motor housing. An inexpensive

Table 1. Methods of eliminating common types of interference appearing on TV receivers.

SOURCE OF INTERFERENCE	METHODS OF ELIMINATION OR SUPPRESSION "What To Do About It"		
	AT THE SOURCE	AT RECEIVER OR ANTENNA SITE	OTHER METHODS
Ignition systems cars, trucks. Ignition systems fixed engines, lighting plants.	(Nothing) Install (replace) commercial distributor suppressors or, encase spark plug with sheet-metal screen grounded to engine block.	Elevate antenna; use more directive antenna; resite. Elevate antenna; use more directive antenna; resite.	
Electric Doorbells Dial Telephone "clicks" Household Appliances washing machines, vacuum cleaners, floor polishers, sewing machines, electric razors, electric fans, vibrators, mixers, etc.	Connect .02 microfarad condenser across two bell terminals. (Nothing) Install low-power appliance filter in series with cord or, connect .02 microfarad condenser across a.c. input terminals of appliance, and tape to prevent shock. (Nothing)	Use a.c. line filter in series with receiver power cord. (Nothing) Use a.c. line filter in series with receiver power cord.	Report trouble to local telephone company. Turn off the appliances.
Oscillators in radio receivers. Refrigerators electric.	Install C or C-L filter across motor terminals also, install C or C-L-C filter in a.c. input cord.	Resite antenna; use more directive antenna. Use a.c. line filter in series with receiver power cord.	Report trouble to owner of receiver.
Industrial equipment cash registers, adding machines, accounting machines, electric typewriters, annunciators, dictaphones, duplicators, etc.	Install low-power appliance filter in series with cord or, connect .02 microfarad condenser across sparking or contact points of equipment or, connect C-L-C filter across contact points of equipment.	Use a.c. line filter in series with receiver power cord; also, elevate antenna; or use more directive antenna; resite, if necessary.	
Induction and dielectric heating apparatus (See Diathermy Machines) Motors and Generators including converters, elevator motors, crane hoists, dynamos, etc. Lighting plants (See Ignition Systems) Air Conditioning Equipment	Install C, C-L, or C-L-C filters across a.c. input of motors, and across a.c. output of generators. Ground chassis of machinery. Install C-L or C-L-C filter across motor terminals also, install C-L-C or C-L-C-L-C filter in a.c. input lead.	Install C-L-C filter in a.c. input lead; also, elevate antenna; resite, if necessary. Use a.c. line filter in series with receiver power cord	When applicable report trouble to local power or utility company.
Traffic Signals Power Lines overhead and underground.	(Nothing) (Nothing)	(Nothing) Use a.c. line filter in series with receiver power cord; also, resite and elevate antenna; use more directive antenna. (Nothing)	Notify local municipal government. Report trouble to local power or utility company.
Telephone Lines overhead open wires.	(Nothing)		Report trouble to local telephone company.
Electric Light Bulbs Electric Signs non-flashing.	Replace bulbs at fault. Install C or C-L-C filter in a.c. input lead.	Use a.c. line filter in series with receiver power cord; also, elevate antenna; or resite, if necessary.	
Electric Signs multi-contact or on/off flashing.	Install commercial flashing sign suppressors in input lead. or, install L-C or L-C-L-C filter in a.c. input lead, but close to switch contacts also, provide additional shielding of switch contacts with sheet-metal screen grounded to frame and to building.	Use a.c. line filter in series with receiver power cord; also, resite and elevate antenna remote from source of "noise."	
Neon Signs all types.	Install special commercial types of neon chokes, neon filters, or neon noise suppressors—all with high- and low-frequency chokes—in a.c. input lead to sign also, reground frame of sign.	Install C-L-C or C-L-C-L-C filter in a.c. input lead to receiver; also, resite and elevate antenna; or, use more directive antenna at high elevation.	
Electrical Gear used by barbers, dentists, hairdressers, etc. Diathermy Machines x-ray machines, violet ray machines, and other types of electro-medical apparatus, also induction and dielectric heating equipment.	Install C-L or C-L-C filter in a.c. input lead. Equipment plus room in which equipment is used must be adequately screened, with bonding and direct ground connections also, double heavy duty L or L-C-L filters must be installed in the a.c. power lead (for the equipment) at the point of entry into room, and at the point of entry into equipment rack or cabinet also, separate heavy duty L or L-C filters must be installed in each secondary power circuit, lighting circuit, and wire-communication circuit at the point of entry into room.	Use a.c. line filter in series with receiver power cord. Elevate and resite antenna; or, use more directive antenna at high elevation.	Report consistent or flagrant interference to Federal Communications Commission, at nearest office, or Washington, D. C.

Principal Types of Filters:

A.C. Line Filter,
Low-power Appliance Filter,
Distributor Suppressor,
Neon Chokes and Filters.

For Special Filters:

C = Condenser.
L = R.f. Choke.

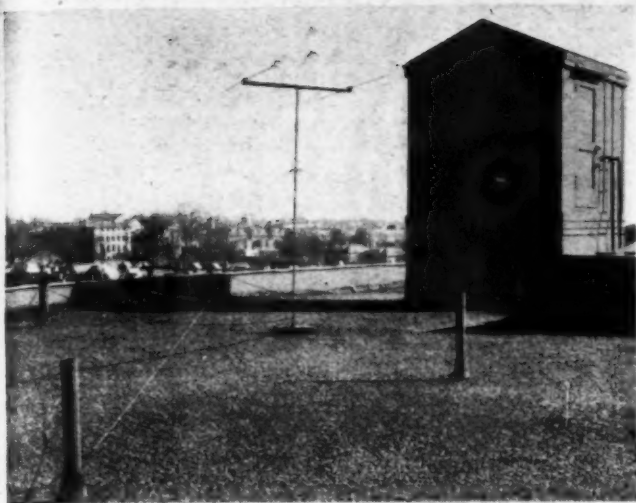


Fig. 3. Siting of this directional antenna in the vicinity of an elevator motor proved a "noisy" location, until a suitable filter was attached to the motor to eliminate the sparking.

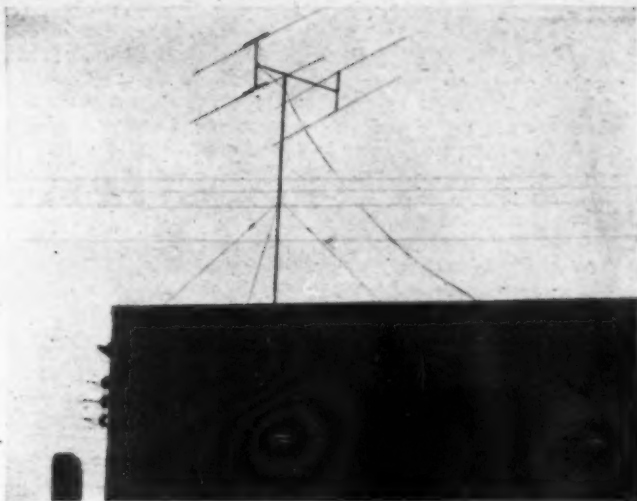


Fig. 4. By increasing the elevation of this duo-dipole and reflector antenna objectionable "noise" pickup from the nearby power lines was effectively eliminated from television screen.

filter, in this case, cancelled the need for a more expensive, highly directional antenna.

Filters, or "suppressors," are small, simple devices consisting of either condensers, r.f. choke coils, or both, arranged in certain "networks" or combinations to provide almost any specified filtering action. Those used in television tend to "block" or choke off any sudden bursts of high-frequency "noise" disturbances created by many types of electrical devices when in operation. Each type of interfering device usually requires an individual filter.

Appropriate filters for specific purposes are available commercially, but any of them can be constructed easily by obtaining and assembling the necessary components. As indicated in Table 1, some methods of "noise" suppression require certain types of filters. The r.f. choke coils (indicated by L) are always connected in series with the line being filtered; condensers (indicated by C) are either connected across the line, or between one side of the line and ground. The basic arrangement of such components is given in terms of letters; thus, L-C-L indicates a choke input, followed by a condenser, and a choke at the output of the filter. This is a convenient method of stating the basic arrangement of filters for special purposes.

Some types of filters are similar to those used for suppressing radio interference, and have been made commercially for many years. However, most filters used for television installations are designed to suppress "noise" over a much wider range of frequencies. Filters are connected only to power circuits and devices. Never connect a filter to any part of the antenna or lead-in, or to the r.f. input circuit of a television receiver.

Diathermy

Particularly bothersome to television reception are diathermy machines and other electro-medical apparatus, which produce either a fixed or slowly

moving "herringbone" pattern of interference. When viewed on the television picture screen, this distinctive pattern appears to be superimposed on the normally received picture image. The brightness of the interference pattern indicates both the strength and nearness of the offending medical equipment.

The principal cure for this type of interference is at its source—usually a hospital, doctor's office, etc.—where adequate screening of the equipment and other measures are required.

The best method of determining the exact location of such apparatus is by means of a small, portable radio receiver capable of tuning anywhere within the range 50 to 200 megacycles. Inexpensive sets can be constructed which will be entirely satisfactory for this particular type of duty as "detectives." There will be no difficulty in hearing and identifying the characteristic "hum" radiated by diathermy machines and other electro-medical devices. Once this is heard, the direction—and thus the location—of the offending equipment can be determined, merely by noting increase in "hum" volume as the portable receiver is moved in various directions.

Operators of such machines are seldom aware of its picture-damaging radiations. When the matter is handled diplomatically, the hospital or institution will cooperate in efforts to shield and restrict such radiations from diathermy, x-ray, violet-ray, and other electro-medical apparatus. The room or rooms housing such equipment should be completely enclosed with screening material—preferably copper, either in thin-sheet or wire-gauze form—with proper bonding and direct, well-soldered connections to ground at several points. Suitable filters must be installed in all wires leading in or out of the room. (See Table 1.)

Similar interference—but at brief, more-or-less irregular intervals—is caused by induction or dielectric heating apparatus, used in commercial

manufacture. Again, the source of interference can be detected and located by use of a small, portable receiver. Again, with the cooperation of the owner or operator, the method of eliminating such interference is by means of a properly grounded shield around the offending instrument.

In cases where non-cooperation is encountered, the continued use of diathermy, x-ray, and violet-ray machines, or of high-frequency heating apparatus, which causes interference on any television channel, should be reported directly to the Federal Communications Commission for suitable action.

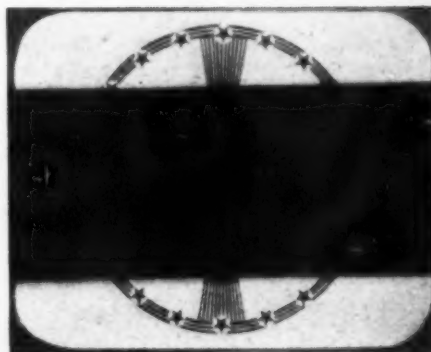
Other Sources

A similar interference pattern of "tweed cloth," or any distortion effect consisting mostly of long, sweeping lines (Fig. 2), is caused by the reception of signals from a radar station or harmonic signals from a radio station. These signals usually have a directional characteristic, however, and the interference can be eliminated by using a more directional receiving antenna. A new site and reorientation may also prove helpful.

Antenna locations near power lines are often "noisy." The resulting effects on the television screen are va-

(Continued on page 135)

Fig. 5. The "blanket" effect caused by 60-cycle a.c. power interference in the video output stage of a television receiver.



FLEAPOW HAM PORTABLE

By

C. C. ERHARDT, W2HNJ



Fig. 1. Front panel view of the completed ham portable. The receiver section is to the left and the transmitter to right.

Just the thing for next summer's camping trip—a complete amateur station operated entirely from dry batteries for use on the 80, 40, and 20 meter bands.

MANY excellent articles have been written on portable amateur equipment, however, almost without exception they require that the operator carry a storage battery under one arm and a vibrator pack under the other. In order to avoid this pitfall it was decided to exploit the possibilities of operating a small transmitter and receiver entirely from dry batteries. To meet the demands of field service a portable rig must be compact, light in weight, and capable of operating on the main amateur bands. The little outfit described here fulfills the above requirements and, considering the low power, has given an excellent account of itself.

The entire unit is housed in a replacement type cabinet that was originally intended for a broadcast band portable. These cabinets are easily obtainable in a variety of sizes and are very reasonable in cost. The one shown here sells for \$3.95 and measures 13 inches long, 9 $\frac{3}{4}$ inches high, and 7 inches deep. It was given a couple of coats of clear shellac and then rubbed down with steel wool. This not only improves the appearance but makes it more resistant to dirt and grease. For an extra .50 cents you may be able to get a ready made chassis to fit, but if not you can "roll your own" without much trouble. For our chassis we used a sheet of $\frac{1}{32}$

aluminum cut to size and bent at the front and back to give a depth of two inches. Exact dimensions have been purposely omitted as they will vary with the type of carrying case the constructor uses. A piece of the same metal was used for the panel and is fastened to the chassis by two small machine screws. As seen in Fig. 4, the panel extends below the bottom line of the chassis in order to adequately cover the two cabinet "windows." A bottom plate (not shown in the photograph) is attached to the chassis as a protective measure. This bottom plate may or may not be necessary depending on how securely the batteries are held in place. When completely assembled, the chassis rests on the two wooden runners with

which the cabinet is equipped, while the panel is held snugly against the windows by a small wood screw in each corner. The only necessity for removing the unit would be a major repair job—coils, crystals, batteries, etc., are easily accessible when the hinged cover in the rear is lowered. A $\frac{3}{8}$ inch hole, drilled on each side of the cabinet and fitted with porcelain bushings provide access for the antenna wires.

A great deal of time was spent on the selection of tubes. The small size and low current drain of the 1T4-1S4 miniatures make them a natural for the receiver. The 1LB4's lend themselves very nicely for a transmitter as they combine low filament drain together with good power output. The number of parts in both circuits was kept to an absolute minimum and wherever possible lightweight, midget parts were used. Bulky components such as audio chokes, output transformers, and loudspeakers were, of course, out of the question.

Fig. 1 shows the front panel controls—receiver to the left, transmitter on the right. Taking the receiver controls first, we find the standby toggle switch and earphone jack on top, the bandspread vernier dial in the center, regeneration control to the lower left and volume control to the right. On the transmitter panel from

Table 1. Details for coil construction.

RECEIVER	
80 m.	L ₁ —17 t. #32 d.c.c. closewound L ₂ —6 t. #32 d.c.c. closewound
40 m.	L ₁ —9 t. #24 d.c.c., spaced to cover $\frac{3}{8}$ " Tap 5 t. from end L ₂ —6 t. #32 d.c.c. closewound
20 m.	L ₁ —5 t. #24 d.c.c., spaced to cover $\frac{3}{8}$ " Tap 2 $\frac{1}{2}$ t. from end. L ₂ —5 t. #32 d.c.c. closewound
$\frac{1}{8}$ " spacing between L ₁ and L ₂ . Bandspread taps counted from gnd. end of coil.	
TRANSMITTER (L ₁)	
80 m.	30 t. #18 en. closewound
40 m.	17 t. #18 en., spaced to cover $1\frac{1}{2}$ "
20 m.	9 t. #18 en., spaced to cover $1\frac{1}{2}$ "

left to right we find the tank tuning condenser, plate current bulb, and antenna loading condenser. The filament switch and keying jack complete the picture.

Receiver

As seen in the diagram we have a 1T4 regenerative detector resistance coupled to a 1S4 audio amplifier. The tickler winding, L_2 , is placed in series with the screen grid and regeneration is accomplished by varying the screen voltage through potentiometer R_2 . In choosing the value of plate load resistor R_1 , some compromise must be made between proper impedance match and having sufficient plate voltage on the detector tube to permit oscillation. 50,000 ohms is a satisfactory value. In place of the usual output transformer in the plate circuit of the 1S4 a 4000 ohm resistor is used. The earphones are at ground potential when connected as shown and the phone jack need not be insulated from the panel. Although a mica condenser was used for C_1 , paper will do the trick just as well. Volume is more than ample and is controlled by varying the grid bias on the 1S4 with potentiometer R_5 .

Looking at Fig. 4 will give you a good idea of the mechanical layout. Separate antennas are used for the receiver and transmitter in order to permit break-in operation. Button type feed-through insulators are used for this purpose. Immediately to the right of the receiver antenna feed-through (the left hand one in Fig. 4) will be found a three lug mounting strip which is used for mounting the antenna coupling condenser. This condenser, a 0-30 μ fd. trimmer, is soldered directly across the two outside lugs and is adjusted with an insulated screwdriver through a hole in the rear of the chassis. A rubber grommet prevents the trimmer plate from touching the chassis when set at minimum capacity. On the same line with the antenna condenser is a five lug mounting strip which forms an anchorage for the battery wires. The detector tube socket is at the lower left with the r.f. choke between it and the regeneration control. The remainder of the receiver parts will be obvious. Two switches are used for the receiver— S_1 , which is actually part of the volume control, turns on the filaments, while S_2 cuts off the "B—" during extended transmitting periods.

The plug-in coils are wound on old 5-prong tube bases of $1\frac{1}{4}$ inch diameter. After a coil has been wound and found to be operating satisfactorily a coat of coil dope will help to keep the windings in place. Good bandspread is secured by tapping down on the secondary with bandspread condenser C_2 . However, for the 80 meter band this condenser can be connected directly across the secondary. The bandset condenser, C_3 , is a 350 μ fd. trimmer which is made a permanent part of each coil. It is supported within each coil form by two pieces of No.

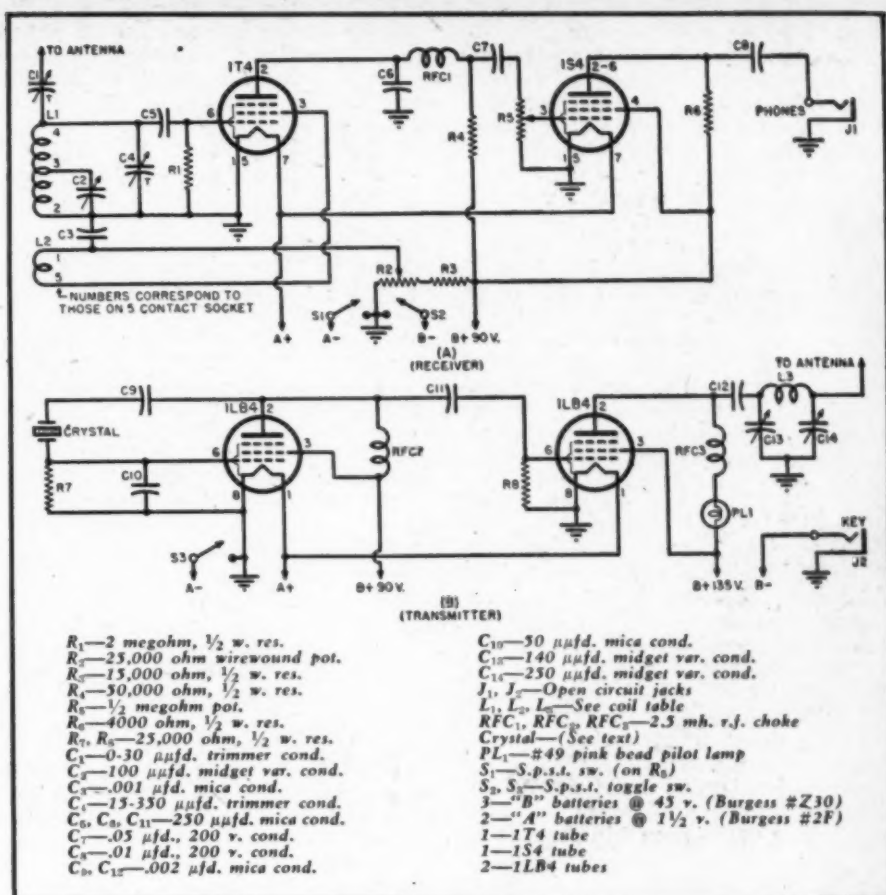
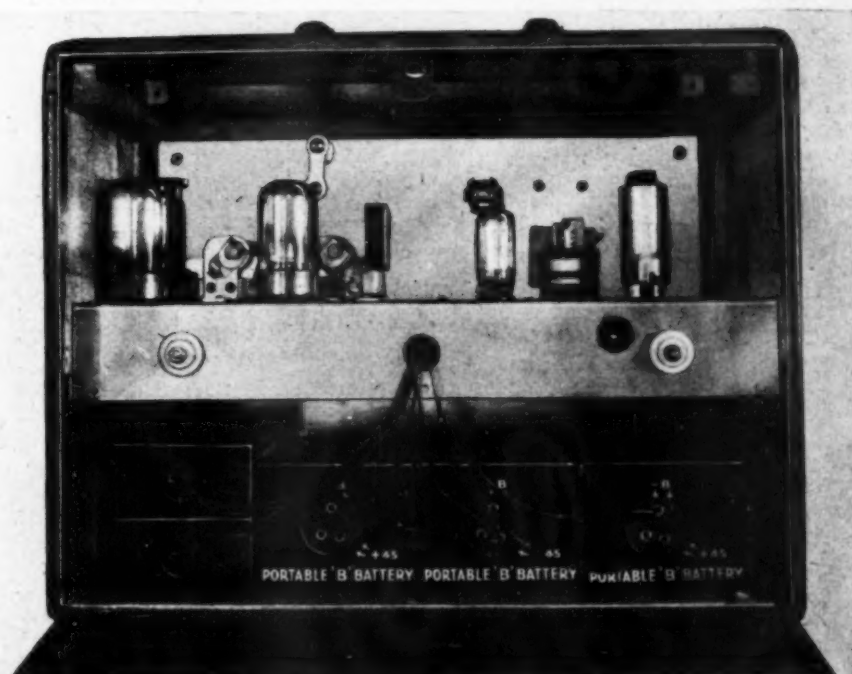


Fig. 2. Schematic diagram. Plug-in coils are used to cover 80, 40, and 20 meter bands.

18 wire which are soldered into pins 2 and 4. This saves an extra tuning control as once set for each amateur band this condenser requires no further attention. Some departure from the coil data given in the table may be made on the 80 and 40 meter bands

without noticeable effect, however, the 20 meter coil will be more critical. If the receiver goes out of oscillation easily or does not oscillate at all, then add a turn at a time to the tickler winding. If on the other hand, oscillation cannot be controlled, then remove

Fig. 3. Rear view of home-built transmitter-receiver. The cabinet is a standard replacement type unit used extensively for broadcast band portable receivers.



turns. In any case, be sure that both windings are in the same direction. It must also be remembered that the antenna has a definite loading effect upon the tuning circuit, therefore no calibrating or other adjustments should be attempted with the antenna removed. A short length of wire will usually work OK on the higher frequencies. The antenna coupling condenser will need to be adjusted whenever changing bands—it should be set for minimum capacity consistent with smooth regeneration over the entire band.

In calibrating the coils for each band it is best to use another receiver of known calibration in order to secure the necessary check points. This is how it's done: Tune the known receiver to the low frequency end of the 80 meter band. Now, placing our newly constructed set in an oscillating condition, turn the bandspread condenser to almost maximum capacity, and then with an insulated screwdriver turn the bandset trimmer until a whistle is heard in the calibrated receiver. Next, set the latter at the high frequency end of the band. Tune the bandspread condenser of the new receiver until another whistle is heard and we will have a rough calibration of the band. Repeat for each band. The calibration will vary somewhat, of course, each time the antenna condenser is adjusted.

Transmitter

Referring to the diagram, we find a 1LB4 Pierce oscillator capacitively coupled to a 1LB4 "class C" amplifier. One side of the filament (A—) forms the common cathode return. It will be noted that the usual screen dropping resistors and associated bypass condensers have been omitted as they were found unnecessary. Keying is very simple—the keying jack is placed in the "B—" lead. This also eliminates the need for a separate "B" supply switch for the transmitter. A 60 ma. pilot light is used as a plate current indicator. If you can get hold of a pilot light with a lower current rating

than 60 ma., so much the better. When fully loaded the amplifier tube plate current never exceeds 25 ma., therefore the bulb will only light dimly. The best indicator, of course, would be an 0-25 milliammeter. Plug-in coils, wound on standard 1¼ inch, four prong forms are used for the tank circuit. Ready made coils may also be used, if desired, providing that tuning condenser C_{11} is changed to the proper value as specified by the manufacturer. Parallel plate feed is used in the amplifier stage. This has the advantage of allowing the two tank condensers to be mounted directly on the chassis. Doubling may also be accomplished in the amplifier stage, but it is not recommended. Not only would the power output be materially reduced, but the keying characteristics may also be impaired.

Figs. 3 and 4 show clearly the layout of the parts. The two Bud variable condensers are provided with threaded mounting lugs which are secured to the chassis with ¼ inch machine screws. Be sure that the condensers are lined up perfectly straight otherwise the tuning knobs will be crooked. A small tri-square will be handy for this purpose and also for lining up the mounting holes on the tube sockets. Directly above the two variables you will find the plate current bulb. The bulb socket is supported by a porcelain standoff which in turn is secured to the panel. The amplifier tank coil may be seen hiding behind its respective tube on the left hand side of Fig. 3. No. 18 enameled wire, covered with spaghetti, is used for wiring the r.f. amplifier tank circuit. It is run through rubber grommets to the two tuning condensers. A piece of the same wire is used to make connection to the antenna post. An important point to bear in mind is that the leads on coupling condenser C_{11} must be kept short—one inch at the most. A short length of bare wire is used on each tube socket to connect the tube shield and A— directly to the chassis. A soldering lug placed under one of the mounting screws provides

a convenient ground. Short, direct leads in the plate and grid circuits provide for maximum efficiency. As in the case of the receiver, a rugged system of construction is followed. Liberal use is made of lockwashers and soldering lugs—and in addition, all parts weighing more than a germ's eyelash are supported by mounting lugs. Once again, a 5 lug terminal strip is used to anchor the battery wires.

Although separate filament batteries are used for the transmitter and receiver, the same "B" batteries are used for both. This works out better than you might expect as normally the receiver "B—" is turned off while sending. A jumper is run from the "B+" post on the receiver to the "B+ 90" post on the transmitter. Another jumper is run between the common "B—" terminals. With the batteries placed as shown in Fig. 3 they just fit in snugly. If any unused space is left over it is a good idea to fill it with rolled up paper in order to keep the batteries stationary. In some cases it may also be necessary to stuff paper between the batteries and chassis.

Tuning

The transmitter is designed for operation on a "long wire" antenna. This simply means a wire that is run in as straight a line as possible—measured from the antenna post to the furthestmost insulator. Although the rig will tune up to almost any length of wire, for best results the antenna should have a resonant frequency which falls within the desired band—133 ft. for 80 meters, 66 ft. for 40 meters, and 33 ft. for 20 meters.

In testing the transmitter the following procedure is recommended:

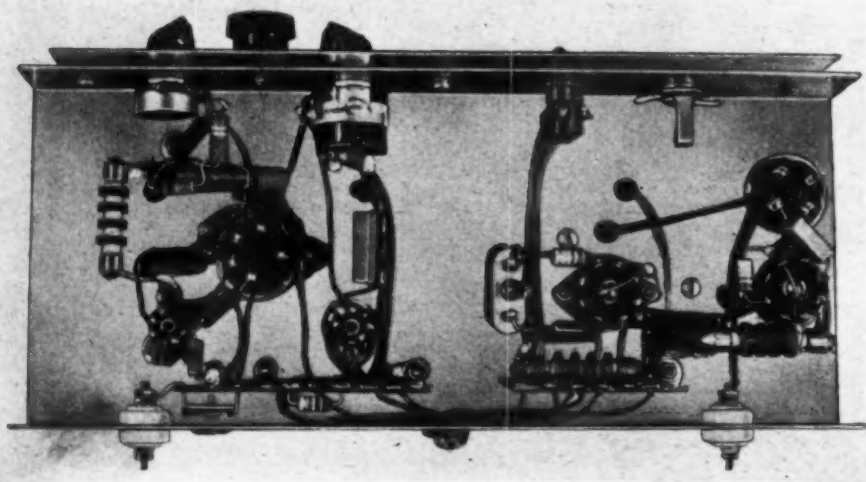
1. Plug in the crystal and the oscillator tube, allow the tube to heat up, then close the keying circuit. If a one watt neon bulb lights up when touched to the grid post of the amplifier tube socket then your oscillator stage is perking. If no soap, then you can suspect a dirty crystal (clean with carbon-tet), or possibly insufficient feedback, which can be remedied by increasing C_{10} to 100 or 150 μfd .

2. Next, plug in your amplifier tube and the proper tank coil. Set loading condenser C_{11} with the plates completely meshed. With the keying circuit closed the plate current lamp should glow dimly, and as tuning condenser C_{12} is tuned to resonance a point will be reached where the lamp goes out. As a second check, touch your neon bulb to the stator of the tuning condenser and rotate again until maximum brilliance is secured.

3. Connect the antenna and set the loading condenser at a slightly lower capacity (unmesh plates). Retune C_{12} to resonance. Keep advancing C_{11} and retuning C_{12} until that point is reached where the plate current bulb will only dim slightly. If the bulb will not dim at all then you are overloading and C_{11} must now be returned

(Continued on page 181)

Fig. 4. Under chassis view of fleapower ham portable.

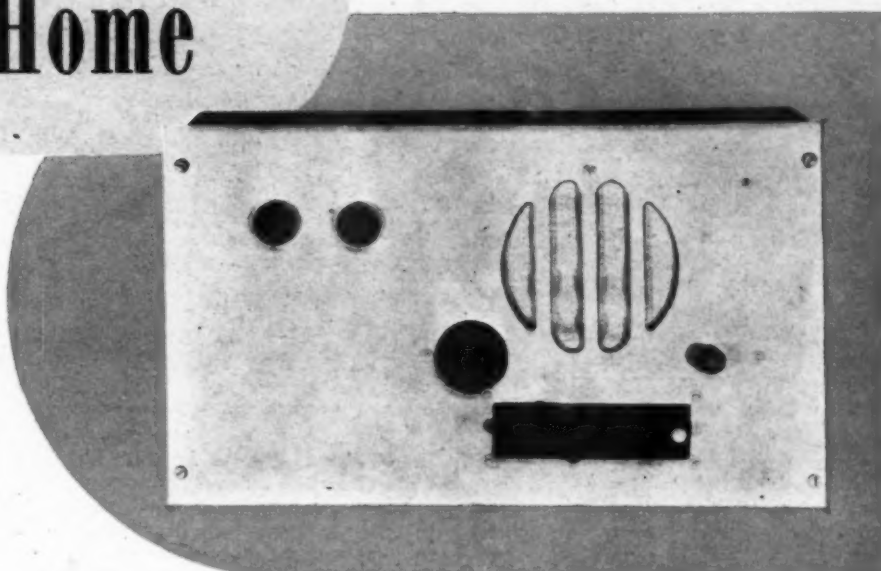


INTERCOM for Modern Home

By
FRANK A. BRAMLEY

Operate your home in the modern way. Eliminate the unnecessary steps in your home—install an intercom.

The central control unit is placed in the most accessible location in the home. On the front panel are mounted the keyboard assembly, speaker grille, pilot light, volume control, "on-off" switch, and the push-to-talk button.



AMONG the dreams of the returning serviceman, that of a truly modern home with all conveniences, probably stands out from all the rest. As a result of service training, many thousands of young men are thoroughly grounded in the principles of electronics, but even the tremendous expansion which is unquestionably ahead may not provide enough jobs for all those competent to work in the field. Many will adopt radio as a hobby and there is no more desirable hobby than one capable of producing a useful device.

Since before the war when his home was built, the author has had a dream that some day his home would have a complete and versatile intercommunication system. The end of the war has brought a more normal amount of spare time, with the result that this dream project has now been completed.

The need for intercommunication does not stem from the size of the house as the author's home is a simple, six room cottage of Cape Cod design. Such a system is a real step-saver for busy homemakers and is also likely to be fun for Dad to construct.

The communicator about to be described is of unusual design and is intended to fulfill every conceivable need in the modern home and yet retain its inherent simplicity. The system incorporates only one amplifier and main control point which will usually be placed in the kitchen, although any other convenient central point may be selected. From this point wires radiate to every room in the house, including one or more to the cellar, and perhaps the garage. By this time the reader may have de-

cided the device is too expensive for his pocketbook, but this need not be the case, as will be disclosed.

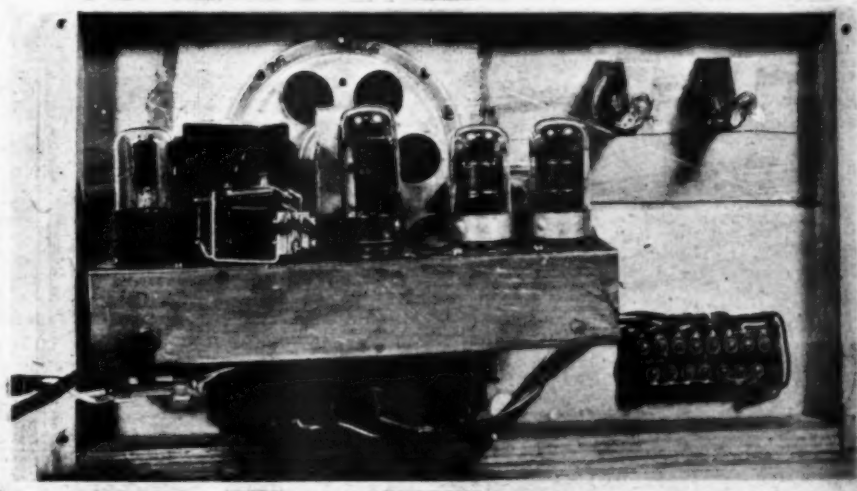
If $\frac{1}{2}$ inch, thin wall, electrical tubing is run to every room while the house is being built, the wires may be easily installed later. The author installed the conduit himself one Saturday afternoon, while his house was in the 2 x 4 stage. Several pieces of tubing were run vertically from the cellar and terminated in boxes on the first and second floors. The piping to connect these risers together in the cellar may be installed after the house is finished, or they need not be so connected at all unless the cellar is finished off.

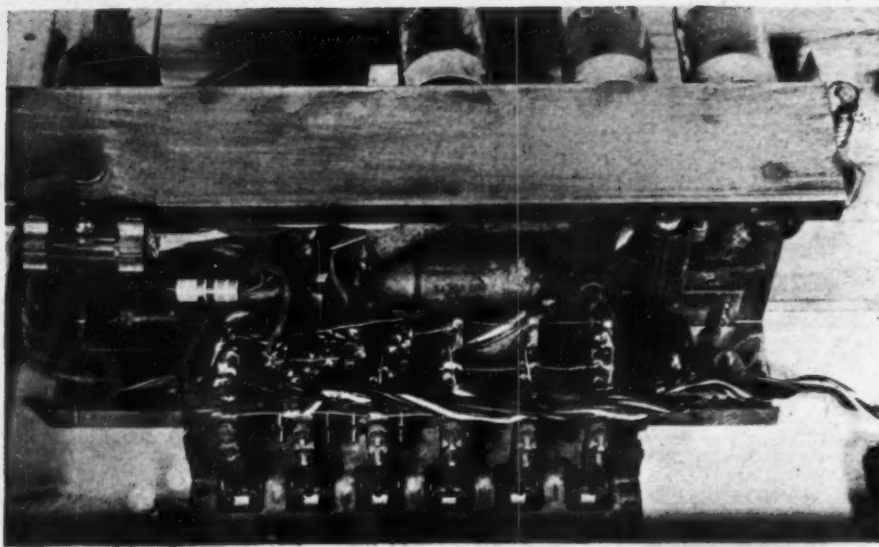
This piping arrangement has other uses. Telephone extensions may be neatly and quickly installed in any room. A riser may also be extended

to the attic with boxes on each floor. This will provide a channel for transmission lines from various aeri-als that may be used and then discarded as the field progresses. In this electronic age, even a low cost home for a radio-minded owner should contain these conveniences. Numerous other uses will suggest themselves.

The central equipment consists of a 3-stage amplifier, a key box, a pilot light, and volume control. It is the wiring of the key box that makes possible this very versatile instrument. Each station selector key has three positions. The center position is "off," the "up" position connects the remote speaker to the output of the amplifier and the "down" position connects the remote speaker to the input of the amplifier. The key is constructed so that it locks in any of

Rear view of control unit. While two pilot light assemblies are shown, only one is used.



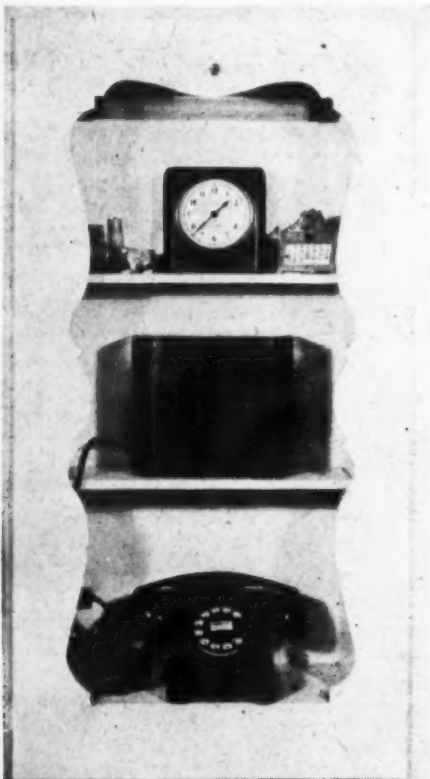


Under chassis view of intercom. The keyboard unit shown is assembled separately.

the three positions. Since there will be a similar key for the wiring running to each room, it becomes possible to hook up any room to any other room and also monitor the proceedings at the central control point. Another key switch reverses the amplifier for talk-back from the central control point, or by means of a relay, the amplifier may be reversed for talk-back from the remote point. By throwing the proper keys any conceivable combination may be achieved.

One of the most common and effective uses of this device will be to

One of the remote-speaker assemblies. This unit can, in many cases, be made to fit in with the decorative scheme in the home.



listen in on the children's activities when they are supposed to be in bed. Mother can, while doing the dishes in the kitchen, readily hear what they are up to and suitably admonish them without leaving her work. Orders given over a loudspeaker seem to be more than usually effective. The unit may also be used to monitor the sickroom or nursery. If children or older people are sick, it may be very difficult for the nurse to hear their calls from another room. If the key in the sickroom or nursery is placed in the "up" position, connecting it to the amplifier input, and the key for the speaker in the nurse's or mother's sleeping room is in the "down" position, connecting it to the output, sounds originating in the sickroom may be continually monitored, and, if desired, two-way contact may also be maintained. In fact several rooms may be monitored at once or the sounds picked up may be reproduced in several places. Dad may work in the cellar or garage and overhear the children's cries while mother goes downtown. It is also possible to install a waterproof speaker near the front or back door so that a sick person, when left alone, could "answer" the door. Other uses will suggest themselves—such as getting Dad or the children up for breakfast.

It is not necessary to install a complete and extensive system at one time. With open conduit and wall boxes installed at the time of construction, wires and speakers may be added as the need arises and as time permits.

The central amplifier will, of course, have a built-in speaker, but plug-in speaker connections in each of the rooms plus two or three portable speakers will fill the needs of most small homes. When Dad wants to work in his photographic darkroom and Mother goes downtown while the children have their nap, speakers plugged into sockets in the rooms concerned will allow Dad to be

sure he is not neglecting his children while pursuing his hobby.

Technical Description

An amplifier for use in sleeping chambers must be hum free and it is difficult to make the usual a.c.-d.c. amplifier really hum free and to expect it to give trouble-free service for long periods. For this reason it is suggested that an a.c. type of amplifier be used, as shown in the circuit diagram. This circuit uses a filament transformer but no plate transformer, which increases the reliability over a straight a.c.-d.c. circuit.

As in a.c.-d.c. sets the plate supply is taken directly from the a.c. line. The sizes of the condensers in the amplifier, while not critical, are selected to give good voice quality as the device is not intended for the reproduction of music, although use of the amplifier for that purpose has been considered.

One of the keys on the amplifier is a "push-to-talk" switch that reverses the amplifier to permit two-way conversation from the central control point. As is usual with communicators, the operator must "push-to-talk" and "release-to-listen."

For "talk-back" control from a remote point a relay is required. When a spring-return type of switch at the remote point is closed, current flows through the relay from the power supply and reverses the amplifier. This switch must be operated just like a "push-to-talk" switch.

Remote points cannot call in unless the key attached to their circuit on the central control unit is suitably thrown. Remote speakers, as well as the built-in monitor speaker, must be of the permanent magnet type. All of the speakers should be of the same impedance and be carefully matched to the output transformer. If several speakers are connected at once, a reduction in volume must be expected. Some speakers built for communicator purposes have an impedance of 50 ohms and will not work when associated with standard speakers having an impedance of about 4 ohms. As many key switches as are desired, plus one for "talk-back," are mounted together on the front panel of the amplifier, as well as a pilot light and volume control with switch.

The wires leading to the remote speakers require special consideration. If the remote units need not originate calls only two wires will be required, but if Dad wishes to admonish the children from a monitor speaker in the cellar, for instance, there must be a third wire to complete the relay circuit to reverse the amplifier while he talks.

The very best installation would involve the use of a shielded two-wire cable with a third external wire for relay operation. One of the shielded wires would be common, although not grounded, and the remote control "talk-back" switch would be completed through it. Ordinary twisted

pair or "twisted three" wires may be used quite successfully although there will be some tendency to hum and oscillation. Such an installation has proved satisfactory in the author's home.

A slightly better amplifier might be constructed using quick heating tubes d.c. operated from the rectifier circuit. This would enable instantaneous operation and give the unit slightly greater usefulness under some circumstances.

In the author's home the amplifier and key box are mounted together on the wall of the kitchen. A hole was cut in the wall and the equipment was placed in the recess between the walls. The panel is made of wood with openings for the speaker and keyboard. The chassis is attached to this panel and projects into the partition. All wires are attached to the rear of the chassis as they emerge from a conduit from the cellar. It is advisable to enclose the whole chassis in a metal box to reduce the possibility of fire hazard. Space may be left on the panel to mount indicators for equipment located in the cellar which may be left on accidentally. The photograph shows this feature.

The connections for the "talk-back" switches need some additional explanation. If it is not necessary for the remote points to originate "talk-back," no relay will be needed. In other words, if while Dad is working in the cellar and listening to the children while they nap and need not talk to them from his monitoring speaker, the wiring can be slightly simplified. In place of the relay at the central control point, a double-pole, double-throw switch may be used. When the relay is used the "talk-back" switch at the central control point becomes a single-pole, spring-return switch and the relay contacts take the place of those that otherwise would have been on the manual switch. The "talk-back" switches at the remote speakers are always of the single-pole, spring-return type.

The relay winding must have a high resistance d.c. coil that will operate on 10 mils or less and the contacts must be double-pole, double-throw. A 10,000 ohm coil is best, but a coil having less resistance may be used providing enough resistance is connected in series with the winding to limit the current to a reasonable value. A 5000 ohm coil with a 5000 ohm resistor in series would probably work all right.

The lines running to the remote speakers should be shielded from each other in spite of the fact that they may be inside of pipe. The pipe is merely used to provide an easy method of installation after the house is built. The pipe should be grounded as should the shielding, but the wires should not be grounded because they would then connect to one side of the power line. As shown in the circuit diagram, one side of the line is connected to the common side of the wiring in the chassis and to one side of the power line. Note that the metal chassis of

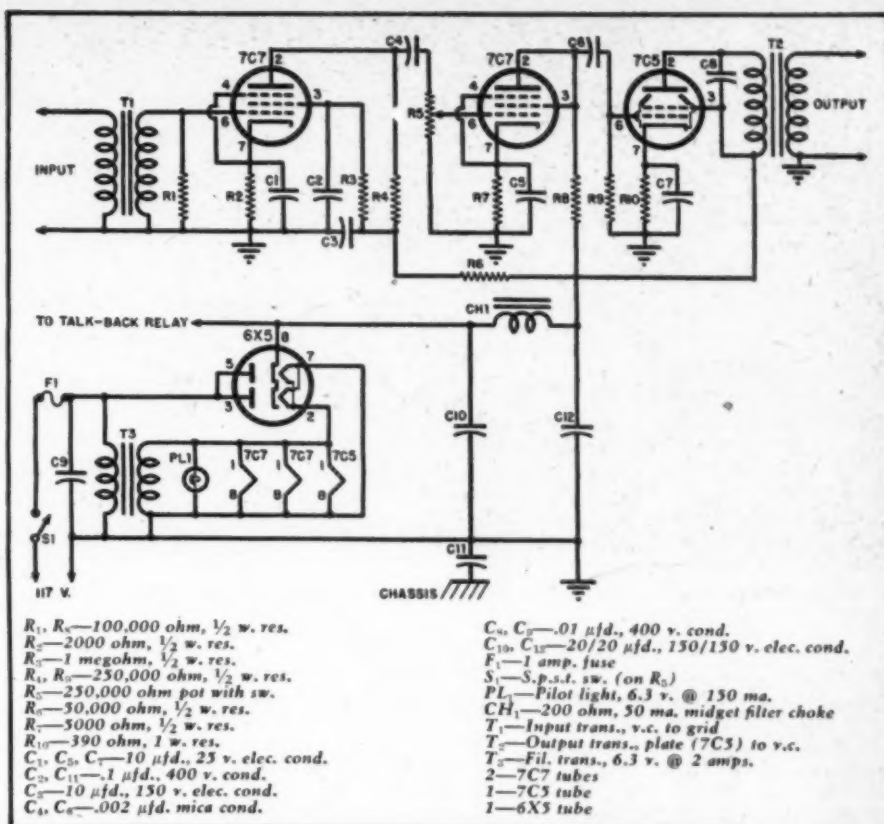


Diagram of amplifier unit. Circuit is conventional, using three stages of amplification.

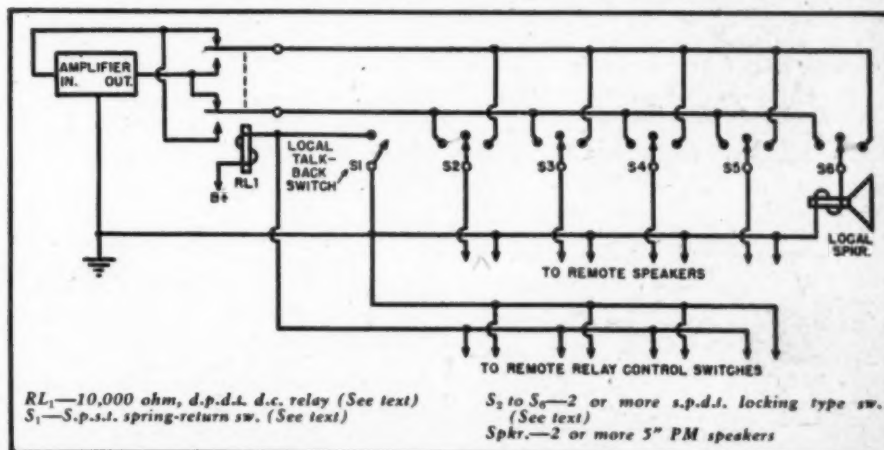
the amplifier is not directly connected to the common side of the wiring of the unit or to ground. This is now standard practice in a.c.-d.c. circuits and it is the safest way to build a.c.-d.c. equipment.

After construction has been completed there will be only one thing in the nature of an adjustment to be made; the input and output transformers should be phased for best operation. With all connections made and the local and remote speakers connected, try reversing the polarity of either the input or the output transformers. Either the primary or the secondary may be changed, whichever is most convenient. It may be somewhat easier to make the test if a re-

sistor of the proper size is substituted for the remote speaker voice coil, since the test must be conducted with the local speaker connected to the output of the amplifier while the remote speaker is connected to the input and there will be a tendency for howling to occur due to acoustical feedback. The purpose of the test is to determine the polarity of the transformer windings that will give the least electrical feedback from input to output of the amplifier—acoustical feedback must be prevented during the test. With this completed there should be no other adjustments required other than routine adjustment of the volume control to suit conditions in the home.

—30—

Schematic diagram of keyboard assembly. Relay can be omitted if the talk-back feature is eliminated. A d.p.d.t. switch may then be substituted for the relay.

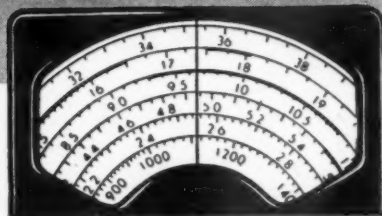




International

SHORT-WAVE

Compiled by **KENNETH R. BOORD**



For Beginning SWL'S

IT IS a pleasure this month to dedicate the *ISW Department* to the "beginning" SWL (short-wave listener). We are grateful to the Amalgamated Short Wave Press, Ltd., London; August Balbi, California; Lee Neidow, Jr., Chicago; Paul Kary, Pennsylvania; DXSA, Australia, and others for some of the following suggestions to the "beginning" SWL.

International broadcasting stations (and amateur transmitters) are usually found within certain small ranges on the dial of your receiver. There are a number of so-called broadcasting "bands"; for example, the 11, 13, 16, 19, 25, 31, 41, and 49 meter bands; and the amateur stations normally operate on the 2½, 5, 10, 20, 40, 80, and 160 meter bands.

In some countries, listeners think of stations as transmitting on a certain wavelength (meters), but at international radio conventions of the past, it was decided that channels be allocated according to frequency (in kilocycles), that is in multiples of one-thousand cycles, specified in "kilocycles-per-second." Nowadays, frequencies are often given in megacycles-per-second where one megacycle (mc.) equals one-thousand kilocycles (kcs.)

Channels are usually allocated to stations in intervals of 5 kcs. over the range, 1500 to 30,000 kcs., though quite a number of stations are now operating on frequencies that are not multiples of 5 kcs. The object of allocating channels at 5 kcs. intervals as often as possible is to attempt to cut down interference between adjacent stations, but in the case of broadcasting stations in particular, this interval is usually not sufficient to ensure complete freedom from interference.

Some stations give their call-sign in frequencies (kcs. or mcs.) while others use wavelength (meters); still others announce both. Some receivers, likewise, are calibrated in kilocycles (or megacycles) while others use meters for that purpose. These are merely two different ways of measuring sound waves, remember. One (frequency) is the number of times each wave rises and falls in a second; the other (wavelength) is simply the length of that wave in meters. (Overseas, "meter" is usually spelled "metre.")

Here is an easy formula which you can use if you want to convert fre-

quencies to wavelengths, and vice-versa:

$$\frac{\text{The frequency in kcs.} = 300,000}{\text{wavelength in meters}}$$

$$\text{And the wavelength in meters} = \frac{300,000}{\text{frequency in kcs.}}$$

As an example, the frequency of WWV, 10,000 kcs. (or 10 mcs.), the Bureau of Standards station in Washington, D. C., may be converted to its equivalent wavelength in this manner:

$$\frac{\text{The wavelength (in meters)} = 300,000}{10,000 \text{ kcs.}} = 30 \text{ meters}$$

Conversely, let's take the wavelength of ZFY, 50.00 meters, Georgetown, Guiana:

$$\frac{\text{The frequency (in kcs.) equals } 300,000}{50 \text{ meters}} = 6000 \text{ kcs. (or 6 mcs.)}$$

The short-wave bands do get more complicated—so here is a list compiled by engineers of *Radio Malaya* Singapore, to cover normal listening requirements:

The 61 meter band (63.00 to 60.00 meters) = 4.762 to 5.000 mcs.

The 49 meter band (50.00 to 48.39 meters) = 6.000 to 6.200 mcs.

The 41 meter band (41.67 to 41.10 meters) = 7.200 to 7.300 mcs.

The 31 meter band (31.58 to 30.93 meters) = 9.500 to 9.700 mcs.

The 25 meter band (25.63 to 25.21 meters) = 11.700 to 11.900 mcs.

The 19 meter band (19.87 to 19.54 meters) = 15.100 to 15.350 mcs.

The 16 meter band (16.90 to 16.81 meters) = 17.750 to 17.850 mcs.

Call-Signs

All countries are allocated blocks of letters from the alphabet from which they can choose their call-signs. International prefixes are as follows:

B—Great Britain (temporary); CA—Chile; CF—Canada; CL—Cuba; CN—French Morocco; CO—Cuba; CP—Bolivia; CQ—CQ—Portuguese Colonies; CS—CU—Portugal; CV—CX—Uruguay; CY—CZ—Canada; D—Germany; EA—EH—Spain; EI—EJ—Eire (Ireland); EK—Japan; EL—Liberia; EM—EO—Japan; EP—EQ—Iran; ER—Japan; ES—Estonian S.S.R.; ET—Ethiopia; EU—EY—Japan; EZ—Germany; F—France and Colonies; G—Great Britain; HA—Hungary; HB—

Switzerland; HC—HD—Ecuador; HE—Switzerland; HF—Poland; HG—Japan; HH—Haiti; HI—Dominican Republic; HJ—HK—Colombia; HL—HM—Japan; HN—Iraq; HO—HP—Panama; HQ—HR—Honduras; HS—Siam; HT—Nicaragua; HU—El Salvador; HV—Vatican; HW—HY—France and Colonies; HZ—Saudi Arabia; I—Italy; J—Japan; J—Allied Military (temporary); K—United States; K—Philippines (temporary); LA—LN—Norway; LO—LW—Argentina; LX—Luxemburg; LY—Lithuanian S.S.R.; LZ—Bulgaria; M—Great Britain; N—United States; OA—OC—Peru; OD—Lebanon and Syria; OE—Austria; OF—OJ—Finland; OK—OM—Czechoslovakia; ON—OT—Belgium and Colonies; OU—OZ—Denmark; PA—PI—Netherlands; PJ—Curaçao; PK—PO—Netherlands East Indies; PP—PY—Brazil; PZ—Surinam (Dutch Guiana); Q—Reserved for coded signals only; R—U.S.S.R.; SA—SM—Sweden; SN—SR—Poland; SS—SU—Egypt and Sudan; SV—SZ—Greece; TA—TC—Turkey; TD—Guatemala; TE—Costa Rica; TF—Iceland; TG—Guatemala; TH—France and Colonies; TI—Costa Rica; TJ—TZ—France and Colonies; U—U.S.S.R.; VA—VG—Canada; VH—VN—Australia and New Guinea; VO—Newfoundland; VP—VS—British Colonies; VT—VW—India; VX—VY—Canada; VZ—Australia; W—United States; XA—XF—Mexico; XG—XU—China; XV—XW—France and Colonies; XY—XZ—Burma; YA—Afghanistan; YB—YH—Netherlands East Indies; YI—Iraq; YJ—New Hebrides; YL—Latvian S.S.R.; YM—Formerly Danzig; YN—Nicaragua; YO—YR—Rumania; YS—El Salvador; YT—YU—Yugoslavia; YV—YW—Venezuela; YX—YZ—U.S.S.R.; ZA—Albania; ZB—ZJ—British Colonies; ZK—ZM—New Zealand and South Pacific Islands; ZN—ZO—British Colonies; ZP—Paraguay; ZQ—British Colonies; ZR—ZU—Union of South Africa; ZV—ZZ—Brazil.

Identification

A variety of interval signals are used by short-wave stations of the world and they are important not only as a program "fill-up," but also as a means of identification. This latter aspect is of prime concern to the DX'er whether he be listening to strong or weak signals. How often has Drake's Drum identified a BBC transmitter for a DX'er? Some stations

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PHONO-COMBINATION



Tops all Competition!

Compare these features:

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- **5 Tubes exclusive with Air King!** ... 5 tube amplifier (including rectifier) guarantees finest fidelity.
- **Has radio attachment!** At no extra cost there's a cable attached to record on wire from radio without use of microphone. This assures original high fidelity. Can also dub in voice (through mike) while recording from radio.

• **Practical, compact carrying case!** Housed in sturdy wooden luggage-type carrying case.

• **Console features in portable case!** Has the superior engineering qualities of a console wire recorder including automatic shut-off (motor shuts off automatically after wire rewinds)... safety lock that prevents accidental erasures... visual-tone indicator to maintain recording level... highly sensitive microphone with table stand makes it ideal for conference use... few simple controls, most easy to operate!

• **Price is complete ... includes these extras!** Two spools of wire... cord for radio recording... microphone table stand.



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BEAUTY FOR DUTY



THE TURNER MODEL 33D DYNAMIC

The Turner 33D Dynamic microphone is designed with an exceptionally smooth wide-range response and high effective output. It is ideal for both voice and music pickups where quality of reproduction is desired. Engineered with Alnico magnets and Turner precision diaphragm for maximum sensitivity. The entire circuit is well shielded to prevent extraneous pickup. Modern streamline design and rich satin chrome finish matches the quality of its performance. Recommended for recording, public address and call system, and amateur work. Also available as Model 33X with high quality crystal circuit.

SPECIFICATIONS

Level . . . 54db below 1 volt/dyne/sq. cm. at high impedance.
Response Flat within ± 5 db from 30 to 9000 c.p.s.
Impedance 50, 200, 500 ohms, or high impedance.
Directivity . . Semi-directional. Non-directional when tilted full 90°.
Cable 20 ft. shielded, removable cable set.
Coupler Standard $\frac{1}{8}$ "—27 thread.

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announce their call-signs but seldom, often much too infrequently, and even then it may be lost in the QRM/N (interference)—but the inclusion of a familiar interval signal easily seals the identity of a transmitter. Modern broadcasting technique has developed to the place where program planning allows little or no spare time at the conclusion of a half hour's program. Thus, the use of an identifying signal is lessened much to the consternation of the DX-er, who often waits patiently for longer than some folks would think reasonable in the hope that the all-important interval will reveal the location of a transmitter.

The variety of interval signals in use today is only dictated by the number of countries using the ether. A few of the more common identifications which come readily to mind are *Radio Australia's* Kookaburra Laugh and "Waltzing Matilda"; the famous Kremlin Bells of *Radio Moscow*; India's oriental notes; the trumpet fanfare of Paris; and the horn-tones of Czechoslovakia. A host of others could be mentioned which include metronomes, whistles, tin pipes, chimes, and gongs. Also, the use of a national anthem oftentimes aids in the identification of a particular country.

The DX-er owes a debt of gratitude to the prosaic interval signal—for whether it comes from Europe, Asia, South America, or some remote island, it can greatly add to the enjoyment of his hobby.

In general, the two all-important guideposts for the "beginning" SWL are: (1) *When* to tune; and (2) *how* to tune.

To learn "when" to tune, provide yourself with a good, up-to-date SW log, or better yet, join an active radio club that sends out current schedules and tips regularly.

As to "how" to tune, be sure you have the band-changer control set to the correct band. Turn the main tuning knob *slowly and carefully*. It is usually wise to turn the volume entirely on (unless noise is very high) until you have correctly dialed the station you want (this prevents passing over a weak signal). When selection has been made, you can then reduce the volume, which will consequently cut down on noise which might hamper enjoyable reception. If your receiver is equipped with a tone control, setting this in the "bass" position will oftentimes tend to reduce noise level.

By following these simple suggestions you can soon learn first-hand how thrilling it is to listen direct to the short-wave "voices" of the universe—with the whole world literally at your fingertips!

Reporting

The reporting of short-wave reception is one of the most popular aspects of short-wave listening. Reports should *always* receive adequate preparation. Many DX-ers, although they may consider that the "verification" is

RADIO NEWS

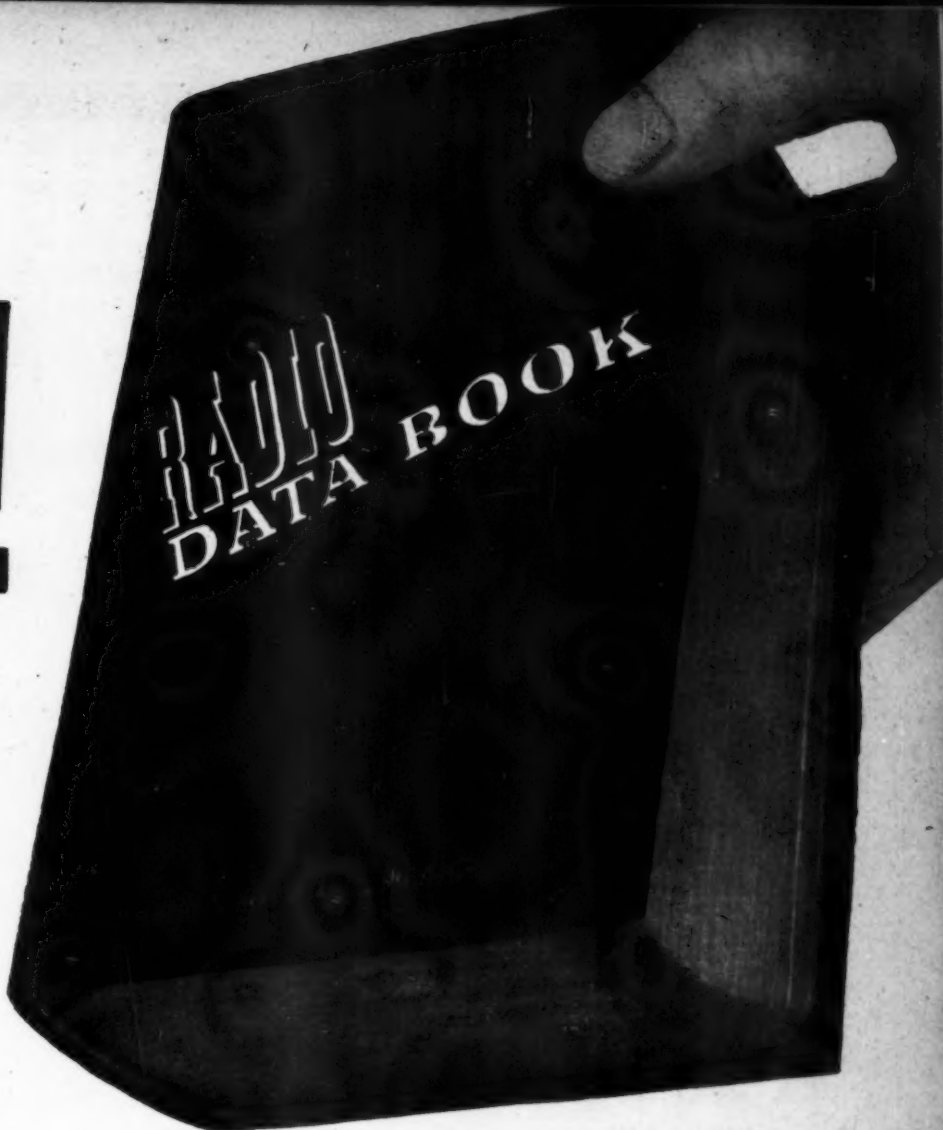
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SCOOP! All Transvision 12" STANDARD Kits can now be had equipped with superb FM RADIO at the extra cost of only \$7.95!

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Picture size 1½ times larger than with 10" tube . . . A big 75 square inch picture!

Sharp, steady picture achieved with advanced Transvision television circuit. Picture has remarkable brightness even in lighted room (no darkening of room is required). **IDEAL FOR HOME or COMMERCIAL INSTALLATIONS.**

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12" TRANSVISION TELEVISION KIT . . . DeLuxe Model with Superb Built-in F.M. RADIO. Same characteristics as the Standard Model, plus the following **ADDITIONAL FEATURES:**—50-216 mc continuous tuning . . . Covers the entire F.M. band and all 13 television channels . . . Cut-off switch eliminates unused tubes when set is used only as F.M. receiver . . . **LIST \$359.00**

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Transvision all-channel R.F. unit is factory pre-wired and tuned for 7 channels* (covers all channels in lower and higher bands in any single area operating presently or in the future). Average sensitivity 20 microvolts; has R.F. stage before oscillator; complete with 3 tubes; 1-6AK5, 1-6AK6, 1-6C4; input impedance—300 ohms, balanced to ground. Size—9½" deep, 4½" high, 6¾" wide. *NOTE: No single area is scheduled for more than 7 channels. However, 6 more channels can be added to this unit, if desired, at nominal factory cost. It is not expected that these additional 6 channels will be required for several years. **LIST \$37.95** Same R.F. Unit, plus FM Band. **LIST 47.95**

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NOTE THESE NEW, REMARKABLE FEATURES: Weighs only 3 ounces (without the cord) . . . Delivers working output of 200 watt iron at fraction of current normally consumed by heavier irons . . . Heats up in 20 seconds . . . Finger-tip button control . . . Cool grip . . . Retains heat (with switch off) up to one minute . . . Featherweight permits long periods of soldering without fatigue . . . Economical—intermittent control feature prevents tip corrosion and necessity of frequent cleaning . . . Long, thin tip permits soldering in tight corners . . . Tips are interchangeable to suit work at hand . . . For operation on 110V, AC, 60 cycles. Complete with 6 volt transformer. **LIST \$13.95**

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12" KIT (Table Model)

ALL TRANSVISION KITS ARE COMPLETE

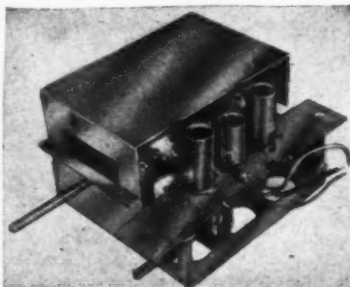
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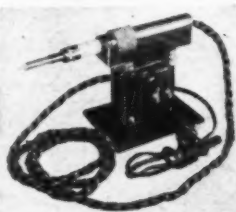
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ALL-CHANNEL R-F UNIT



Featherweight Soldering Iron

the "pay-off," yet are careless in reporting. This is most unfortunate for both the stations and the DX-ing fraternity.

It is true that some stations do not verify. On the other hand, some stations will answer almost any report, especially those stations that take the opportunity to send their listeners propaganda literature. However, you should *invariably make your reports of value to the station!* The report that is submitted solely with the intention of securing a verification is usually so obvious in nature that few stations will deem to reply, even if return postage is enclosed. The QSL card (or letter-verify) should be regarded by the conscientious listener as a token of appreciation from a station for services rendered, and reports should be compiled accordingly. With this attitude established, the reporter will stand a much better chance of receiving a reply.

Here are a few hints on reporting and verifying:

1. Be certain you *actually* have the station; listen for *positive* identification.

2. Make *complete* notes, listing what *actually was heard* during at least 15 minutes of a particular transmission period, preferably longer. (Make such report on *each* frequency of a particular station that you want verified.)

3. Make your report from what you have set down; be *brief*, but be *specific*. List time of individual items (recordings, identification, type of program, actual speech if you have it down, and the like) in GMT (5 hours ahead of EST), which time is used by most stations on their logs. Mention signal strength, fading if any, interference, and so on; tell what kind of receiver was used, type of antenna; state weather conditions at the time you monitored the station. If you can offer *constructive* criticism and suggestions that would be helpful to the station, by all means do so. Ask for a verification of your reception.

4. Send your report *first-class* mail—being certain that sufficient postage is affixed to reach the country of destination. Some stations require return postage and when in doubt be sure to send an International Reply Coupon (IRC), obtainable at your local postoffice (costs 9 cents in the U. S.). Many DX-ers send reports *first-class airmail* with quicker and oftentimes more effective results. (Air-letter forms should be used for *only* those stations that do not require return postage.)

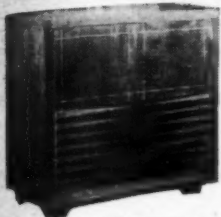
5. Finally, if you know the language of the transmitting country, write in that language; otherwise, use *English*. Be certain you have the correct address on the envelope as well as your own correct address on both the envelope and the report.

Then wait and hope—give the station ample time to reply (ofttimes this requires 3 to 6 months). It is permissible

(Continued on page 128)

BUILD THIS 8-TUBE RADIO-AMPLIFIER • COMPLETE KIT—ONLY \$29.95

DELUXE CONSOLE CABINET \$39.95



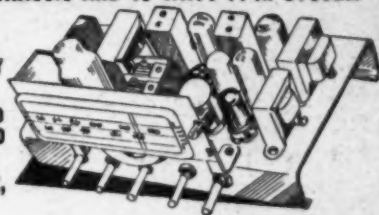
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- BEAUTIFUL ALL WALNUT CONSTRUCTION

This is the first time we have been able to offer a beautiful floor model console, RADIO-PHONO cabinet. Finest all walnut construction; hand rubbed finish. 34" long, 33" high, 16" deep. Holds 12" speaker, large record

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Price with Two Post Oak Changer.....\$56.95
IF DESIRED, WE CAN FURNISH THIS IN BLOOD MAHOGANY AT \$10.00 EXTRA.

- A COMBINED BROADCAST SUPERHET RADIO CHASSIS AND 15 WATT P. A. SYSTEM
- HEAVY DUTY 12" P.M. SPEAKER
- GROW 8" SLIDE RULE DIAL. 2 GANG COND.
- REC. BROAD. 550 TO 1700 KC. HI-FIDELITY PUSH PULL 6V6—TWIN TONE CONTROLS
- INPUTS FOR CRYSTAL OR DYN. MIKES AND PHONO-PICKUP. WE FURNISH EVERYTHING TO BUILD THIS DELUXE CHASSIS
- WHY NOT ORDER THE CONSOLE ON THE LEFT, WITH YOUR PRK-10



Here is something new in radio. A real 15 watt power amplifier with bass and treble controls. Has extra gain stage for crystal or dynamic mikes. And on the same chassis, a standard superhet radio receiver. We furnish all parts, knobs, escutcheon plate and tubes: 6SA7, 6SK7, 6SR7, 6SN7, 6SJ7, two 6V6 and 5Y3. No cabinet. Extra care in designing the power supply section assures low hum level, making this unit ideal for recording as well as P.A. use. We furnish everything as well as schematic diagram and photos of the completed chassis. Weight 35 lbs.

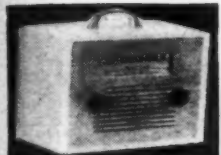
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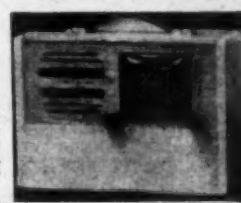
- 4-Tube Broadcast Superhet
- Priced Complete with Batteries
- Dynamic Speaker • Slide Rule Dial

PERSONAL PORTABLE KIT MODEL K-PX. Small size leatherette covered case 9x5 1/2x5. Easy to build. Operates on self contained B and A batteries. Rec. Broadcast 550 to 1600 K.C. Incorporates a standard and superhet circuit with. Has 3 inch Alnico five PM speaker. Priced complete with batteries, and speaker. Net \$10.95.

Illustration diagram and tubes 1R5, 1R5, 1T4 and 384. Not AC DC, but straight battery operated. Has 2 gang cond. Everyone should have one of these personal portables. Everything furnished. Kit K-PX.....Net \$10.95

3-WAY PORTABLE KIT, \$17.95

- 4 Tubes Plus Disc Rectifier
- 300 Hour Battery Pack Included
- Beautifully Built Portable Case



Build this powerful, 4-tube, 3-way portable kit. Operates on 110 volts AC or DC or self contained batteries. Receives broadcast 550 to 1650 K.C. Incorporates a standard superhet circuit with AVC and loop Ant. Has Alnico 5 PM Speaker, 2 gang condensers. All parts and batteries are furnished including tubes, Disc Rectifier, 1R5, 1T4, 1R5 and 384. Has attractive leatherette portable cabinet size 7x9x9. Weight 14 lbs. Kit Model 3-WA. Net \$17.95

5-Tube AC-DC Broadcast Kit, \$9.95

BEAUTIFUL 10" PLASTIC CABINET
LOOP AERIAL • VERNIER DIAL
DYNAMIC SPEAKER • EASY TO BUILD



Kit Model P-85. We have finally been able to achieve our goal. Here it is. A good 5-tube broadcast AC DC superhet radio receiver for less than ten dollars. The beautiful 10 inch plastic cabinet is made of the finest material. The chassis is of the standard accepted superhet design. 456 KC. AVC and 5 inch Alnico 5 PM speaker. Attractive vernier dial. Two gang tuning condenser. Loop ant. We defy anyone to offer a better working AC DC receiver kit. Priced complete with diagram, photos and tubes. Has 3 inch Alnico five PM speaker. Priced complete with batteries, and speaker. Net \$9.95.

4-Tube, 1 1/2—90 Volt FARM RADIO KIT complete, less 1000-hour battery: similar cab. to Model P-85. Model PB-48.....Net \$9.95

12-WATT AMPLIFIER KIT, \$10.95



PUSH PULL 6V6 OUTPUT TUBES
GAIN FOR MIKE AND PICK-UP
EVERYTHING FURNISHED. EASY TO WIRE
FINE TONE QUALITY

KIT MODEL AC-12. 12 watt amplifier kit. Ideal for high quality record player as well as public address or recording amplifier. Matched component parts ready punched chassis pan. One control fades from phono to microphone. Gain enough for crystal or dynamic microphone, 100 mill power transformer, for 110 volt AC 60 cycle operation. Priced complete with tubes: 2-6V6, 6SN7, 6SJ7 and rectifier. Diagrams and photos furnished. Kit AC-12. Net \$10.95. 15" Alnico 5 PM speaker \$6.95 extra; crystal microphone and desk stand \$4.95 extra.

1948 MODEL—MIKE-OSCILLATOR ONLY \$7.95

Broadcasts 800 to 1500 KC from either a phono-graph pick-up or a crystal or dynamic mike. Makes any radio receiver a P.A. system, record player or recording amplifier. Gives broadcast quality. Has fader control from mike to record, simulating a regular broadcast station. This is a powerful model; using 2-35L6, 128J7 and 35Z5 tubes. Priced with tubes and connecting instructions. Wired and tested. Works on 110 volts AC-DC. Crystal mike and desk stand \$4.95 extra. Model DE-5 truly a de-luxe mike-phonos oscillator.



MIKE-OSCILLATOR 800 to 1500 KC

Mike Oscillator Model C-4. Not only does the unit work as a phono-osc., but has added gain stage for a crystal mike. Priced complete, wired and tested with 2 tubes and fader control. Net \$4.95. Crystal Mike.....\$4.90 extra

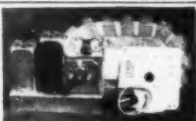


3-TUBE PHONO. OSC. ONLY \$3.95



Model DE-4—Phonograph oscillator. Broadcasts from 800 to 1500 KC. Gain for any crystal pick up. A new powerful circuit is used to assure plenty of power. Has variable gain control for proper modulation. Priced complete, wired and tested. Model DE-4 Net.....\$3.95

SUPERHET BROADCAST TUNER for connection to phono amp. or P.A. system. Compact chassis 5x3 1/2x3 inches. May be mounted inside the record player cabinet. Requires only three connections to amplifier. Uses 6SA7 or 12SA7, 6SK7 or 12SK7 and crystal diode. Complete with tubes, loop antenna, dial and instructions for connecting to any amplifier. Net \$7.95. Specify if tuner is to be used with AC or AC-DC type amplifier.



RA-10 RECEIVER \$11.95

RA-10 4 bands; 150 to 400 KC, 400 to 1100 KC, 2 to 5 MC, and 5 to 10 MC. 7 tubes of the 6 volt type. Has 28-volt built-in dynamotor. Shipped less remote control. Only a few to sell at \$11.95. Case size 10 x 12 x 14 inches. Weight 20 lbs. Price.....\$11.95

PORTABLE RADIO RECORDER KIT \$54.95

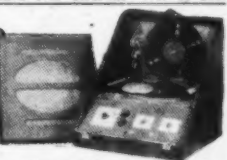


\$90.00 value for only \$54.95. We furnish every part to build a powerful radio and dual speed recorder. The attractive leatherette case houses the sensitive superhet broadcast radio and General Industries B90L 35 1/2 and 78 RPM dual speed recorder; play back mechanism. The 6 tube receiver and amplifier is all on one chassis: 12SA7, 12NQ7, 12NK7, 12SL7, mike gain; two 35L6 push-pull output tubes. Has plenty of gain for crystal or dynamic mike. Has 6" heavy duty PM speaker and tone control. Kit G-31, everything complete, with tubes and diagram. \$54.95. Crystal mike and desk stand \$4.95 extra. This is without a doubt one of the best values in kits we have ever offered. Wt. 40 lbs.

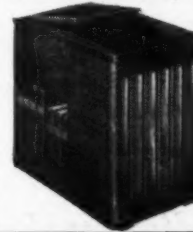
put; plus disc rectifier. Has plenty of gain for crystal or dynamic mike. Has 6" heavy duty PM speaker and tone control. Kit G-31, everything complete, with tubes and diagram. \$54.95. Crystal mike and desk stand \$4.95 extra. This is without a doubt one of the best values in kits we have ever offered. Wt. 40 lbs.

WIRE RECORDER KIT—\$79.50

Here is what you get. A Webster 79 wire recorder mechanism, with 15 minute spool of wire, a portable leatherette split case, a 10" PM speaker. Complete kit of parts to build an 18 watt power amplifier, with gain for crystal or dynamic mike. Complete wiring schematic and instructions. Amplifier incorporates 2-6V6, 6V6 eraser circuit, 1-6J5, 2-6SN7, and 5Y3, and all circuits and switches necessary to record or play-back on wire. This amplifier may be used as a conventional P.A. system. A real value. Xtal Mike \$4.95 extra. Kit Model WSW-7. Net.....\$79.50



ARM CHAIR CABINET \$29.95



Beautifully made, walnut Armchair cabinet. Outside dimensions, 24 high, 16 1/2 wide and 27 inches deep. Ample room for radio receiver and changers up to 14" square. Will hold 15" speaker. Net. \$29.95. Receiver compartment size 15 x 10 x 10 inches. Has un-cut receiver and changer panel.

20-WATT UTILITY AMP. KIT, \$17.95

Build this 20 watt utility 110 volt AC, 20 Watt power amplifier. Ready punched aluminum chassis, size 12 x 6 x 2 1/2 inches. Has two input circuits, one mike and one phono. Mike stage has 135 DB gain, for crystal or dynamic mikes. Has bass and treble controls. Designed for use with PM speakers; has 8-16 ohm output transformer. All parts, controls, transformers and easy-to-follow diagram furnished, including tubes: 2-6SN7, 6J5, 2-6L6GA, 5Z3. Kit Model 20-LX. Net.....\$17.95



15" 15 watt Alnico 5 PM speaker, \$6.95 extra. Studio crystal mike and desk stand, \$7.95 extra.

6-110 VOLT UTILITY AMP. KIT, \$29.95

Model X-26L 20 watts output. Similar in appearance to the model 20-LX except on slightly larger chassis. Has same tube line up and input circuits. Has power supply that will work on 6 Volt DC, or 110 Volts AC. Equipped with super heavy duty vibrator. Has output voltage to run a reg. AC phono motor when used as a 6 volt unit. All parts tubes and easy to follow diagram furnished. Model X-26L amp. kit. Net \$29.95. Ship. weight 30 lbs. Latest 12 in. P.M. Alnico, V speaker, 12 watt. Net.....\$6.95

Crystal mike and desk stand.....7.95

9-TUBE KIT \$19.95

ANK-11 Kit. A deluxe 9 tube, twin speaker, high fidelity receiver kit; housed in a beautiful hand rubbed walnut cabinet; of latest design, with dual speaker grills perforated gold tint plastic.



Circuit employs push-pull parallel 12A6's delivering 10 watts of undistorted power to twin 6" G.E. Alnico V speakers. Other tubes: 12K8, 12SK7, 12H6, 12J5, 12SL7 and two dry disc rectifiers in voltage doubler circuit (equivalent to 11 tubes in all). Has 10" slide rule dial. Complete with instructions; ready to wire. Your Net.....\$19.95

20-TUBE ARC-4 140-152 MC. \$19.95



Has 6 Volt Type Tubes for operation on VHF frequencies from 140 to 144 MC. Four channels crystal controlled transmitter and receiver. Designed for 12 or 24 volt DC operation. Scoop Price.....\$19.95

McGEE RADIO COMPANY

WRITE FOR CATALOG SEND 25% DEPOSIT — BALANCE C. O. D.
1225 McGEE ST., KANSAS CITY, MISSOURI

MAGUIRE AUTOMATIC RECORD CHANGER

\$9.95



Brand new factory cartoned. This changer should sell for three times our price. Latest two-post, quick change type. Has permanent built-in needle, shuts off on the last record. Plays 12 10" or 10 12" records. Fully guaranteed. Base size 16 x 13 inches. Scoop price \$9.95. Made to fit walnut base \$2.49, extra.

Aero Changer, Base size 12 x 13 inches \$12.95. Walnut base \$2.49 extra.
Vm-800 Changer, Base size 13 x 14 inches \$14.95. Walnut base \$2.49 extra.
Oak Twin-post Changer, Base size 14 x 14 inches \$17.95. Walnut base \$2.49 extra.
General Instrument Deluxe Changer, Base size 11 x 12 inches, \$17.95. Walnut base \$2.49.
Viola Changer, Base size 11 1/2 x 12 inches, \$14.95. Walnut base \$2.49 extra.

G.I. RECORDER MECHANISMS

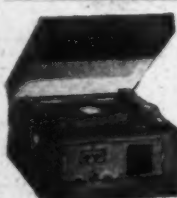


Latest 1947 General Industries recording assemblies with 4 ohm magnetic cutters and crystal play back. Model R70-L-78 RPM. Net.....\$24.02
 Model R90-35 and 78 RPM. Net.....26.37
 Model R130-L-Automatic changer with cutter, 78 RPM. Net.....39.34

Webster 79 Wire Recording Mechanism \$52.92



WEBSTER 79 WIRE RECORDER, PLAY BACK MECHANISM, Wiring diagram of necessary amplifier included with kit. The entire mechanism is a completely assembled unit. Weight 10 pounds. Includes one fifteen minute spool of recording wire. This is the hottest new item in the electronic field. Webster 79 recording mechanism. Net \$52.92; Extra recording wire, fifteen minutes \$2.40; thirty minutes \$3.60; one hour \$6.45



OUR LEADER PORTABLE RADIO RECORDER \$89.50

Our leader AC radio and dual speed recorder. Another leading value in the electronic field. We bought them right and are passing on our buying power to you. This unit has a standard AC power transformer type, broadcast receiver and recording amplifier. Has General Industries dual speed recorder and play-back mechanism, and microphone. A red hot value. Model VT-41 Net \$89.50.

OUR LEADER FM-AM \$29.95

Our greatest AM-FM value. Broadcast and FM band AC-DC, 6 tube plastic radio. Extra sensitive built-in loop, Alnico V 6 1/2 inch oval speaker. Streamline walnut, plastic cabinet, brass grille. Model AM-FM. Net \$29.95.



SCOOP! SILVER VOMAX \$49.95

We have made a lucky purchase, from an over-stocked jobber. The famous Silver Vomag. Vacuum tube volt-ohm-meter. Brand new factory cartoned. Regular net \$59.95. A real value at our price. Only \$49.95.



ELECTRONIC MEGAPHONE SCOOP PRICE \$16.95

Only 40 of these to sell. Original cost many times our price. Amplifier straps on shoulder, then just hold megaphone and speak in mike mounted on rear of projector. These units have been used; horns are slightly dented. Amplifier is conventional type. Shipped with tubes. Net \$16.95. Amplifier is dry battery operated.

"OUR OWN PRIVATE BRAND" OF RADIO TUBES

"HYVAC"39c EACH

100 Assorted for \$35.00

These tubes are boxed and branded HY VAC. All are guaranteed best quality. Full Replacement.

12SA7GT	6K7GT	6SA7GT	6SJ7	1R5
12SK7GT	6A8GT	1B4	12AT6	1S5
12SQ7GT	5Y3GT	39	12BA6	23Q4
3SL6GT	12A5	6SD7GT	12BE5	35A
3SZ5GT	12SR7	6SK7GT	35W4	79L7GT
12K8	6Q7GT	6SQ7GT	50B5	
12SF7	6K6GT	25L6GT	35B5	
30L6GT	6V6GT	11Z3	1T4	
6SN7GT	6X5GT	11L7GT	1L4	

75% OF ALL THE TUBES YOU USE FOR 49c

Guaranteed Standard Brands Cartoned and Uncartoned.

5U4G	6SF5	12SG7	14R7	43	78
6C5	6SF7	12SH7	14S7	45	80
6C6	6SG7	12SJ7	25Z6GT	56	
6D6	6SH7	12SL7GT	26	76	
6F6GT	6SL7GT	14A7/12B7	27	75	
6H6	6SR7	14B6	35Z3	77	
6J5	12C8	14C7	35Z4GT		
6K6GT	12M6	14H7	41		
6SC7	12J5GT	14Q7	42		

7A5	7H7	35A5	1LA4	1LE3
7A7	7H7	02A	1LA6	1LH4
7A8	7Q7	1M5GT	1LB4	1LN5
7B4	7Y4	6A7	1LC5	
7B5	7Z4	6A8	1LC6	
7B6	30	1N5GT	1LD5	
7B7	32	1A7GT		
7C5	33	30S6T		
7C5	34	30A5		
7E7	35A5	35Y4		
7F7	35/51			

CATHODE RAY TUBES

Guaranteed. Brand New

3AP1	\$2.95	5FP7	\$2.95	9LP7	4.95
3BP1	2.95	7FP7	3.95		

"SPEAKERS" WORLD'S LOWEST PRICES

12" PM 7 oz. Alnico V Magnet 18 watts.....	\$5.95
12" PM 5 oz. Alnico V Magnet 15 watts.....	4.95
12" 1000 ohm field Operadio worth 15.00.....	5.95
12" PM 20 oz. Alnico 3 Magnet 20 watt Scoop Price	\$22.50
\$4.95, 5 for.....	\$22.50
10" PM 20 oz. Alnico 3 Magnet 20 watt Scoop Price	\$20.00
\$4.95, 5 for.....	\$20.00
3 1/2" PM 1.5 oz. Alnico 5 Magnet.....	1.19
4" PM 1 oz. Alnico 5 Magnet.....	.99
5" PM 1 oz. Alnico 5 Magnet.....	.99
5" PM 1.5 oz. Alnico 5 Magnet.....	.99
5 1/2" G. E. PM speaker. Mounts for 6 or 6 1/2". Has single output transformer. A \$3.50 value for only \$1.95, 10 for.....	\$13.50
8" Alnico V 2.15 oz. magnet. Made by one of the largest speaker manufacturers. Special.....	\$2.95
Special.....	\$3.75
6 1/2" 1.5 oz. Alnico V.....	\$1.95
6 1/2" 2.15 oz. Alnico V.....	2.49
6 1/2" 3.16 oz. Alnico V.....	2.95
5" 450 ohm Utah.....	\$1.25
5" 3000 ohm Utah.....	1.95
6" 450 ohm.....	2.49
8" 1800 ohm.....	2.95



MALLORY 4-PRONG VIB \$1.29

Heavy duty 4 prong vibrator, 6 volt non-syn. Has 8 points. Standard base connections fits 70% of all car radios. \$1.29 each, 10 for \$11.95, 50 for \$55.00, 100 for \$99.95.

TUBULAR ELECTROLYTICS In paper tubes with pig tail leads

Cornell-Dubilier, 8 Mfd. 450 volt	\$0.39 each.	\$32.90
100 for.....		
Cornell-Dubilier, 16 Mfd. 450	\$0.59 each.	8.25
10 for.....		8.25
Aerovox, 8 x 8 Mfd. 450 volt.	\$0.49 each.	3.90
10 for.....		3.90
Aerovox 20 x 20 Mfd. 150 volt.	\$0.39 each.	3.90
10 for.....		3.90
sprague, 30 x 30 Mfd. 150 volt.	\$0.49 each.	4.25
10 for.....		4.25
Solar 30 x 30 Mfd. 20 Mfd. 25 volt	\$0.59 each.	4.90
10 for.....		4.90

SPECIALS IN TUBULAR CONDENSERS

Cornell Dubilier .05 Mfd. 600 volt condenser. Scoop Price \$0.09 each. 100 for.....	\$7.90
Solar Sealitties .05 Mfd. 400 volt condensers or .01 400 volt \$0.07 each. 100 for.....	\$5.00

600 VOLT TUBULARS, MANUFACTURERS TYPE

Guaranteed all good brands condensers: .001, .005, .01, .02, .05, all 600 volt. Any size \$0.08 each. 100 assorted for.....\$6.50

POPULAR F.P. ELECTROLYTICS

In Alum. Cans. Easy Twist. Mounting all small size. AH are 1x2 or 1x3 in.

40x20 150V.....	39c	16x16x450V.....	49c
40x20 150V. 10x25V.....	49c	20x450V.....	39c
40x20x10 150V.....	49c	20x350V. 20x20 25V.....	19c

15" CINNAUDAGRAPH JUKE BOX SPEAKER \$9.95



Here is without a doubt the best bargain in the whole U. S. A Jumbo 15 in. speaker made for the famous Alcoa Juke box. Has standard 1 1/2 in. 16 ohm voice coil and 12000 ohm field. The field may be easily excited by hooking to your radio or amplifier as a bi-corder. Packed in original cartons. Fully guaranteed. Here is your chance to get a speaker that will bring out those low notes. Our scoop price, \$9.95 each, two for only \$19.00.

"Best Bargain in America"

20 WATT AMPLIFIER \$29.95

This is a beautiful amplifier, fully shielded with cover and radio type indicator knobs. 14 watts average output. 25 watt peak, priced with tubes 6SL7, 2 6BL7, 26V6, 5Y3, 2 mike inputs and phone input. Response 50 to 12000 CPS. Made by Eastern Amplifier Co. Model 14A. NET \$29.95.

LOWEST PRICES ON RADIOS

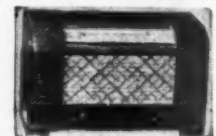
ATLAS 3-WAY PORTABLE 6 TUBES \$22.95



Dealers Net \$22.95 Each. Three for \$66.00. Kit of Batteries, \$2.99 Extra.

Here's the hottest buy you ever run onto in a radio set. Many dealers are selling this same radio for \$49.50 less batteries, under a very popular standard brand name. We were lucky getting a quantity of these sets but of course had to take them under a private brand. You will probably recognize this set. Has 6 tubes as follows: 2-1N5, 8H5, 1A5, 3Q5, 117Z6VT. Has tuned R.F. stage, very sensitive. No doubt one of the best portable radios made. This set sells regular for \$34.50 less batteries wholesale. Hurry your order, only a few hundred available.

6-TUBE AC-DC MAHOGANY CAB. \$17.95



This one is a honey. Sold wholesale in 1947 season for \$25.00. \$39.50 list. We made a lucky purchase of a quantity of these sets. Many were sold under a very popular label for \$25.00 wholesale. You will probably know this set. It's a six tube radio with R F stage, latest AC-DC circuit and is highly sensitive, making it very good for remote locations. Cabinet is high quality mahogany period design. You will like this set. Rush your order. ATLAS 6 TUBE SET NET \$17.95, each THREE FOR.....\$51.65

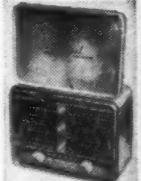
ELECTRONIC LAB. 6-TUBE AC-DC \$16.95



Compares with any set up to \$40.00 list. Has six tubes 2 12SK7, 12SA7, 12SQ7, 35L6 35Z5. Has RF stage. This set is highly popular where stations are hard to get. Has beautiful mahogany cabinet 13 in. long. Slide rule dial. Sold all this season for \$23.75 wholesale. Only a few hundred to sell. Choice of Blond or Walnut Cabinet \$16.95 each. Lots of three.....\$51.65

"HOTTEST PICK ME UP RADIO IN AMERICA" NO TALLER THAN A PEN NET EACH \$22.95 IN LOTS OF 3 \$21.95

Model 747-3 way personal radio. Receives broadcast 550 to 1650 KC. Small size only 4x5x8 inches. However, uses full size parts with 2-gang condenser and loop. Priced complete with 4 miniature tubes and disc rectifier. These sets are only slightly larger than the smallest personal radio. Volume and tone like a big set. Kit of batteries \$2.05 extra.



MECK PEE WEE SUPER \$11.95



Meck, 5 tube superhet; using miniature tubes. Small plastic cabinet (7x4x5"). 2 gang condenser, loop antenna. Alnico 5 FM speaker. This is a red hot value in a small radio receiver; broadcast 550 to 1650 KC. Priced with tubes; ready to play.

Model 800B, Black plastic cabinet.....	\$11.95
Lots of 3.....	\$10.95
Model 800W, White plastic cabinet.....	\$12.95
Lots of 3.....	\$11.95
Weight 5 lbs.	

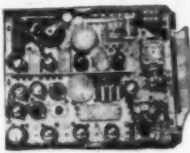
3-TUBE MECK FM CONVERTER \$14.85

Housed in the same cabinet as the MECK 800B shown above. Converts any table or console radio to receive FM programs (new band 88-108 m.c.). Employs super-regenerative circuit that is nonradiating, yet provides full noise reduction and frequency range of FM broadcast. Converts to audio system of AM set in exactly the same manner as you install crystal pickup of phono player (has plug-in connector to use on sets now having phono jack).

McGEE RADIO COMPANY WRITE FOR CATALOG SEND 25% DEPOSIT—BALANCE C.O.D. 1225 McGEE ST., KANSAS CITY, MISSOURI

BC-645 TRANSMITTER RECEIVER \$99.95

2 big units; all in one. A 10 tube superhet receiver for 450 Mc. a 5 tube 450 megacycle tuned line transmitter. Both are two channel. 4-7F7, 4-7H7, 2-7E6, 2-6F6, 2-955, 1-WE 316A. The tubes that come with this unit are worth more than our sale price. This unit originally designed for identification "Friend or Foe" Army BC-645. Brand new factory cartoned, weight 25 lbs. Furnished with four page conversion instructions for a CW or MCW or phone transmitter. How to build a 110 volt AC power supply, etc. 12 volt dynamotor, \$2.95 extra. WE-316A tube \$9.99, BC-645.....\$9.95. 2 for \$19.00



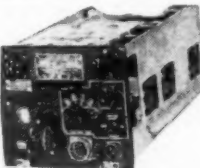
BC-412 \$49.95

BC-412-612 Oscilloscope. Brand new factory cartoned, weight 200 lbs. This unit is the most ideal war surplus scope. Works on 110v 60 cycle AC. Only simple changes (conversion in many radio magazines) necessary to convert to a laboratory test scope. Has twin heavy duty plate supplies and tubes 5BP4 5" scope tube, 6-6L6, 2X2, 5T4, 2-6XJ7, 6XG7, 6H6, etc. Schematic diagram with the last time we have a scope in a scope like this. Net.....\$49.95



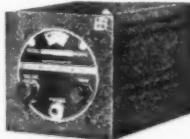
Navy Arb \$16.95

You can convert this over easily to a good ham receiver. It's one of the hottest values in surplus receivers. 28 volts DC input. Covers 4 bands. 195 kc to 9 mc. This is a deluxe type superhet receiver, note that the frequency coverage includes the standard broadcast band. Has 4 gang tuning condenser; can be converted to a 110 volt AC receiver. Priced complete with tubes: 12SF7, 12SA7, 3-12RF7 and 12A6. Has dial built on front of chassis. Electric driven or manual band change switch. Weight 28 lbs. Size 6x7x15 inches. ARB Near new condition, with tubes and dynamotor. Net.....\$16.95



NEW BC-1206 \$5.95

Designed to receive A-N beam signals. 24-28 mcs. Tube complement: 14H7, 14A7, RF, 14H7, 14H7, 14A7, 14H7, IF amplifier: 14H7, detector and 1st audio: 28D7, output. 195 to 420 KC 4" high x 4" wide x 6 1/2" long. Weight 4 lbs.



R-89 \$6.95

R-89/ARN-5 Glide Path Receiver 11 tube superhet. Formerly used for blind landing. Adaptable for many uses. Receives 326 to 335 MC. Contains six relays, 11 tubes 7-6AJ5, 12SR7, 2-12SN7, 25D7. Size 13x5x6. Weight 12 lbs. A beautiful piece of equipment. Has three crystals. Priced complete with xtals and tubes. R-89/ARN-5 Near new condition. Net.....\$6.95



BC-733 D LOCALIZER RECEIVER

Freq. 108-110 Mc; Tube complement: 10 tubes—1-12NQ7, 2-12SR7, 1-12A6, 1-14HGT, 2-12SG7, 3-717A. Now only.....\$6.95

AM-26 \$1.49

AM 26 interphone amplifier. This unit is nice for parts salvage and the aluminum case is usable for receiver building etc. Size 9 1/2 x 4 1/2 x 5". Has two transformers, four tube sockets, three tube condensers, three position panel switch, toggle switch, and many small parts. All are in perfect condition. \$1.49; 2 for \$2.49



RDF RECEIVER

\$19.95

MM-26-C Compass Receiver. Brand new factory cartoned. This unit covers from 150 to 1500 KC inclusive; in three bands. Complete with eleven tubes of the 6 volt type: 6SA7, 6SK7, 6F6, etc. Has 28 volt built-in dynamotor. There is no dial built on unit and no remote cables are provided. MM-26-C receiver \$19.95. Remote control \$3.95 extra. Manually operated loop.....\$6.95. extra



COMMAND REC. WITH DIAGRAMS

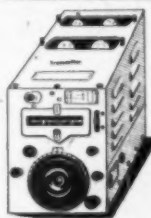
Order your Aircraft command receivers from McGee. We furnish you a schematic of the BC-454 (all are the same except for frequency). Also, a diagram showing how to convert receivers for 110 volt operation.



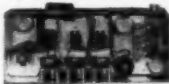
Brand new BC-453, 200 to 500 K.C., with tubes.....\$6.95
Brand new BC-454, 3 to 6 M.C., with tubes.....\$4.95
Near new BC-454, 3 to 6 M.C., with tubes.....\$3.95
Brand new BC-455, 6 to 9 M.C., with tubes.....4.95
Near new BC-455, 6 to 9 M.C., with tubes.....3.95
Brand New BC-946 (broadcast), 550 to 1500 K.C., with tubes and inst.....\$12.95
28 Volt Dynamotor for 453, etc.....\$0.95
Triple remote control head for SCR-274 (BC-453, BC-454, BC-455).....\$1.95
Flexible cable for tuning SCR-274......75
Mounting Rack for three receivers.....1.95

COMMAND TRANSMITTERS \$3.95

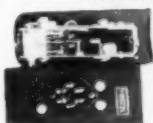
With each command transmitter, we furnish a schematic of the BC-458 (All command Transmitters are essentially the same; except for frequency.)
Brand new BC-457, 4 to 5.3 M.C., with tubes.....\$5.95
Near new BC-457, 4 to 5.3 M.C., with tubes.....\$2.95
Brand new BC-458, 5 to 7 M.C., with tubes.....\$5.95
Near new BC-458, 5 to 7 M.C., with tubes.....\$2.95
Brand new BC-459, 7 to 9.1 M.C., with tubes.....5.95



SWITCH POT SALVAGE 99¢ 3 for \$2.50



VIBRATOR SCOOP \$1.99



Heavy Duty Vibrator—Made for 6-110 volt amplifiers. Freq. 60 CPS. Scoop price.....\$1.99
135 ma 6-110 volt conventional power transformer, with all windings; will run phono motor. \$5.95
(Use with above vibrator.)

VEEDER ROOT METER



Counts number of feet of trailing wire antennae; number turns when winding on coil; applicable for many uses; beautiful bakelite case, jeweled dial, pilot light enclosed, 3 position switch, counts up to 1000. Each.....95¢

NAVY GLIDE PATH SCOOP \$3.95



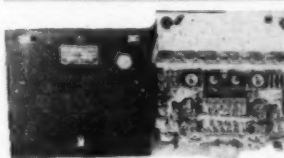
Navy model ZA Glide path receiver. Has 3-6C8 tubes; several controls, transformer and handy case; size 6x7x12 inches. Ideal for salvage, near new condition \$3.95; 2 for.....\$6.95

PACKARD BELL PRE-AMP. \$1.99



Housed in a handy aluminum case 5x4x5, priced complete with tubes 6SL7, 28D7, has many usable parts. Relay and control PL68 plug and patch cord.

G.E. Servo-Amp. Salvage \$1.95



Two for \$3.50
G.E. Servo amp Salvage Scoop. This item is ideal to tear up for the pieces. General Electric Servo amplifier has 14 octal tube sockets, 5 small neon lamps. Lots of condensers, resistors and controls. Salvage value more than the purchase price of this unit. Weight 15 lbs. Brand new. Priced less tubes \$1.95; 2 for.....\$3.50

MODULATOR SALVAGE \$2.49

Another red hot value in salvage. All kinds of good usable parts in this unit. Con. Res. Relays, Modulation trans. and tubes V1150, 12X5 and 16Z5. Brand new and in factory cartons. Originally designed to modulate the BC-457 W.F. Transmitter. You can find many uses for this BC-456 Modulator scoop. Price \$2.49; 2 for.....\$4.49



80 METER XMITTER-REC. \$12.95

Two for \$25.00 BC-654



Portable voice and CW transmitter and receiver for portable, mobile, and fixed station operation. 7-tube superheterodyne receiver with 3.5 microvolt sensitivity on voice and 0.5 microvolt sensitivity on CW and 100 milliwatts undistorted power output. 455 KC IF. Uses 3-1N5GT, 1-1A7GT, 2-3Q5GT, 1-1H5GT tubes. 6-tube transmitter, with antenna tuning network, Colpitts thermal compensated oscillator, class C final with 2-307A tubes in parallel and crystal oscillator for checking frequency every 200 KC. 25 watts output on CW and 11.2 watts output on voice. Frequency range, transmitter and receiver, 3800 to 5800 KC. Ideal for Hamal Comes complete with cover; furnished with all tubes necessary for the operation of the trans. and rec. Less power supplies. These units are used but in good condition. Shipping weight 50 lbs.....\$12.95; 2 for \$25.00
654 Vibrator Pack 6 for 12 V.D.C. input \$4.95 extra
SCOOP. BC-654 Less all tubes. Net.....\$7.95

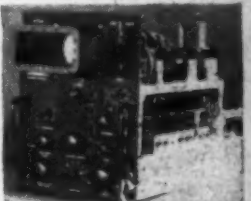
RCA—Aircraft Trans.—Rec.



RCA AVT-112 Transmitter; pictured to the left; Brand new RCA aircraft transmitter. Crystal controlled, 2300 to 6500 KC. Designed for 6, 12 and 24 volt DC and 350 volt DC input. 6 tubes; 6AF6 dual tuning indicator, 6V6 power oscillator, 6V6 P.A., 2-6V6, as plate modulators and 6SL7 tuning indicator amplifier. This is the nicest piece of equipment you have ever seen. 6x6x5 1/2 inches and weighs 6 pounds. All brand new with tubes (less crystal) and complete instruction book. This unit covers 80 meters and 3105 and 6210 aircraft bands. Your Net.....\$12.95
RCA AVR-20A Aircraft Receiver; pictured to the right; A small light weight, companion unit to the AVT-12A. A full 3 gang superhet, covering 3300 to 6500 KC. with tubes 6K8, 6S7, 6F7, and 6B8. Brand new, factory cartoned. This is a beautiful, compact piece of receiving equipment. RCA AVR-20A Receiver. Net.....\$12.95
RCA AVT-12A Transmitter and RCA AVR-20A Receiver. Both for only.....\$24.95

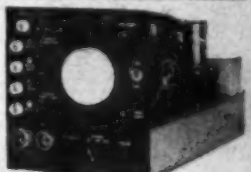
35-TUBE INDICATOR SCOPE \$24.95

E-65 APN-9 — Loran Receiver indicator scope. A compact Airborne unit. Priced complete with 35 tubes, 6SK7, 6SN7, 2X2, etc. Has 3 inch scope tube 3BP1. This unit has many possibilities. More parts, coils and controls than you can imagine. Has 3 100 KC. General Electric crystal. Pictured with case removed. Size 9x12x16. Weight 35 lbs. These units have been in aircraft but we guarantee them to be in good condition. Net \$24.95; 2 for.....\$46.95



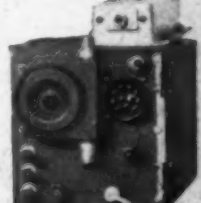
You May Make a 3" Test Scope from this BC-9295, \$14.95 BC929 RADAR, \$14.95

BC-929. A Radar Indicator Scope. This unit could be rebuilt into a fine test scope. It is an ideal size. 8x9x14 priced with tubes 2-6SN7, 2-6H6, 6G5, 6X5 and 2X2. This is a red hot buy. However you will have to change the power trans. for 60 cycle use. Any 50 mill 750 volt radio power trans. will furnish scope H.V. Guaranteed to be in good condition. Scoop Price.....\$14.95
We have a few BC-929 Radar Scoops. Brand new in factory cartons at \$17.50 each.

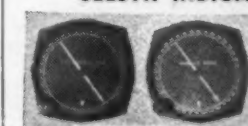


2-BAND RECEIVER

ARC-429. 201 to 400 KC and 2500 to 4700 KC. ARC-429A. 201 to 400 KC and 4150 to 7700 KC. Have plenty of either receiver used but in good condition. Priced with 6.6 volt tubes. Scoop price.....\$2.95



SELSYN INDICATORS \$2.95



Sel syn indicators. 5" diameter. Will operate on from 15 to 24 volts 60 cycle AC. Model I-82A can be used as either sel syn transmitter or sel syn receiver. Scoop Price. \$2.95, 2 for \$5.49

McGEE RADIO COMPANY

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OF "150 NEW
RADIO DIAGRAMS
EXPLAINED"
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"I personally
guarantee that at
the end of 1 year
from date of re-
ceipt, my Applied
Practical Radio
set will have
earned for you at
least 10 times its
cost, or you may
return it and I'll
return every cent
you paid."

B.W. Cooke, Pres.



Here's a sensational "get acquainted" offer! This big, new book, "150 New Radio Diagrams Explained" is yours, absolutely FREE! It contains circuits and data on the latest Radio and Television sets. Easy-to-read, 8 1/2 x 11" size, with full instructions on how to read and use diagrams. Belongs in every radioman's kit.

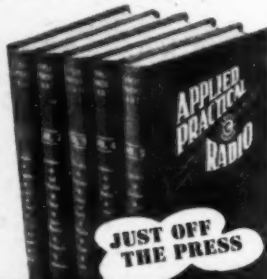
HOW TO GET YOUR FREE BOOK

You get this book Free just for looking over—without cost or obligation—the sensational new 5-volume Coyne set "APPLIED PRACTICAL RADIO." It's just off the press. Here's everything you want to know about radio, from basic principles to up-to-the-minute Television and FM! PA, short-wave, aviation-auto radio, multibands, tele-transmission, testing instruments and trouble-shooting short-cuts, phototubes, etc., all clearly explained. Shows how to construct, install, service all types of apparatus. Step-by-step photos break equipment down before your eyes! Newest testing methods. Hundreds of subjects, over 1500 pages, almost 1000 illustrations, diagrams. Written for home training and field reference—so complete, so up-to-date and practical that every man interested in radio should see it.

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() Check here if you want to pay postman cash price of \$15.00 (you save \$1.75) on delivery. Same Money Back Guarantee after 7 days' trial.

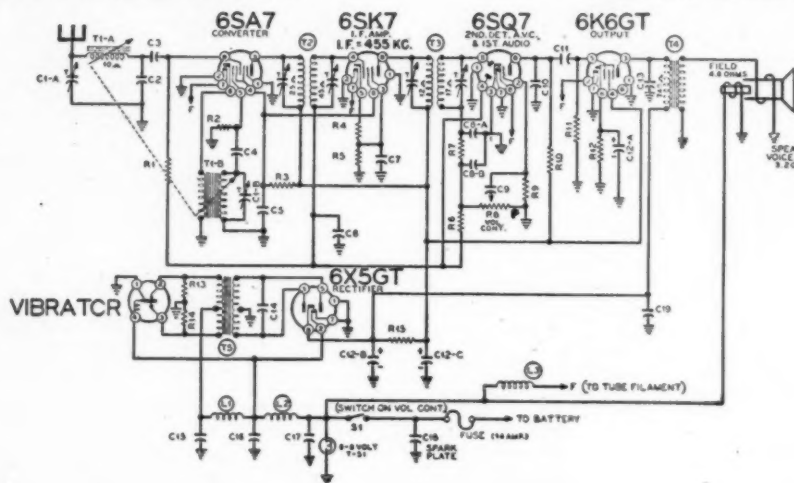


CIRCUIT PAGE

(FOR PARTS LIST SEE PAGE 82)

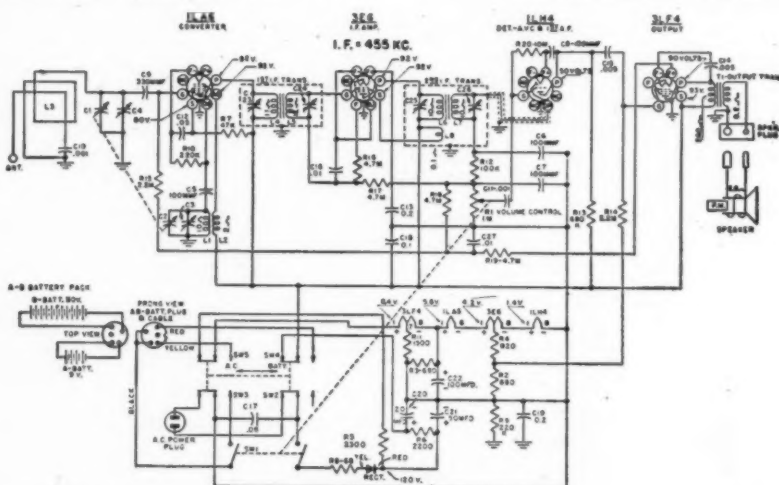
RADIO NEWS, JANUARY, 1948

TRUETONE MODEL D4620



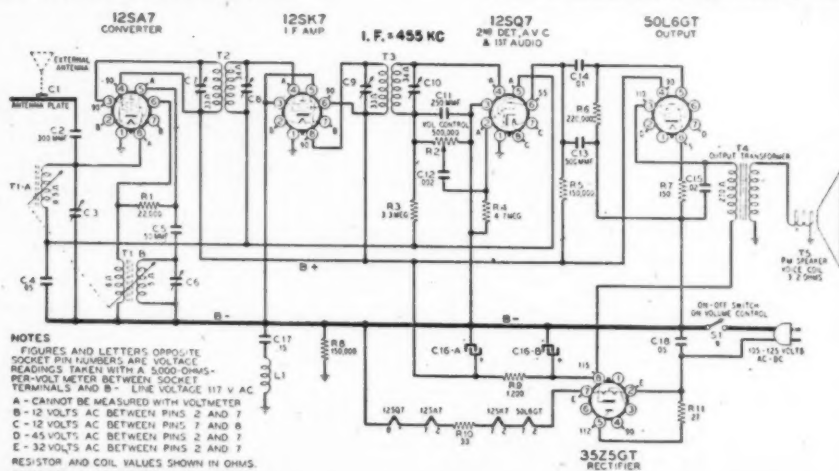
RADIO NEWS, JANUARY, 1948

WESTINGHOUSE MODEL H-148



RADIO NEWS, JANUARY, 1948

WARDS MODELS 54BR-1501A, 1502A



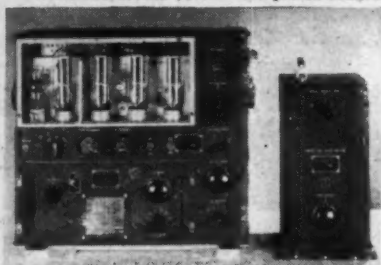
NOTES

FIGURES AND LETTERS OPPOSITE SOCKET PIN NUMBERS ARE VOLTAGE READINGS TAKEN WITH A 5000 OHMS PER-VOLT METER BETWEEN SOCKET TERMINALS AND B+ LINE VOLTAGE 117 V AC
A - CANNOT BE MEASURED WITH VOLTMETER
B - 12 VOLTS AC BETWEEN PINS 2 AND 7
C - 12 VOLTS AC BETWEEN PINS 7 AND 8
D - 45 VOLTS AC BETWEEN PINS 2 AND 7
E - 32 VOLTS AC BETWEEN PINS 2 AND 7
RESISTOR AND COIL VALUES SHOWN IN OHMS
CAPACITOR VALUES SHOWN IN MFD UNLESS OTHERWISE INDICATED

75

RADIOMEN'S HEADQUARTERS *** WORLD WIDE MAIL ORDER SERVICE!!!

Minimum order \$3.00—All prices subject to change—25% deposit with COD orders.



GENERAL ELECTRIC 150 WATT TRANSMITTER

**Cost the Government \$1800.00
Cost to you \$44.50!!!!**

This is the famous transmitter used in U.S. Army bombers and ground stations, during the war. Its design and construction have been proved in service, under all kinds of conditions, all over the world. The entire frequency range is covered by means of plug-in tuning units which are included. Each tuning unit has its own oscillator and power amplifier coils and condensers, and antenna tuning circuits—all designed to operate at top efficiency within its particular frequency range. Transmitter and accessories are finished in black crackle, and the milliammeter, voltmeter, and RF ammeter are mounted on the front panel. Here are the specifications: **FREQUENCY RANGE:** 200 to 500 KC and 1500 to 12,500 KC. (Will operate on 10 and 20 meter band with slight modification.) **OSCILLATOR:** Self-excited, thermo compensated, and hand calibrated. **POWER AMPLIFIER:** Neutralized class "C" stage, using 211 tube, and equipped with antenna coupling circuit which matches practically any length antenna. **MODULATOR:** Class "B"—uses two 211 tubes. **POWER SUPPLY:** Supplied complete with dynamotor which furnishes 1000V at 350 MA. Complete instructions are furnished to operate set from 110V AC. **SIZE:** 21 1/4 x 23 x 9 1/4 inches. Total shipping weight 200 lbs., complete with all tubes, dynamotor power supply, five tuning units, antenna tuning unit and the essential plugs. These units have been removed from unused aircraft but are guaranteed to be in perfect condition.

BENDIX SCR 522—Very High Frequency Voice Transmitter-Receiver—100 to 150 MC. This job was good enough for the Joint Command to make it standard equipment in everything that flew, even though each set cost the Gov't \$2500.00. Crystal Controlled and Amplitude Modulated—**HIGH TRANSMITTER OUTPUT** and 3 Microvolt Receiver Sensitivity gave good communication up to 180 miles at high altitudes. Receiver has ten tubes and transmitter has seven tubes, including two 832's. Furnished complete with 17 tubes, remote control unit, 4 crystals and the special wide band VHF antenna that was designed for this set. These sets have been removed from unused aircraft and are guaranteed to be in perfect condition. We include free parts and diagrams for the conversion to "continuously variable frequency coverage" in the receiver. The SCR522 complete with 24 volt dynamotor sells at only \$37.95. The SCR522 is also available with a brand new 12 volt dynamotor for only \$42.95.

110V. CIRCUIT BREAKERS of Magnetic type: Following Current Ratings in Stock; 1.25, 3, 4, 8 Amps. Please specify. \$1.95 each.

Seven Assorted I.F. Transformers—\$1.98; Five Assorted Oscillator Coils—69c.

SPEAKERS-PM dynamic type—4"—\$1.55; 5"—\$1.55; 6"—\$1.95; 8"—\$3.95; 10"—\$5.95; 12"—\$7.50.

SELENIUM RECTIFIERS—Dry disc type 1 1/4" 1", 1.2 Amp. maximum, suitable for converting DC relays to AC, for supplying filament source in portable radios, converting DC meters to AC applications, and also may be used in low current chargers 90c.

METER RECTIFIER—Full wave, may be used for replacement, or in construction of all types of test equipment—\$1.25.

Half Wave—90c.



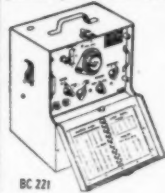
MICROPHONES—All nationally known brands. Bullet crystal—\$5.45; Bullet Dynamic—\$7.45; Mike Jr.—60c; Handy Mike—90c; Lapel Mike—\$3c; SHURE T-17 VIKERS, with push to talk switch—\$9c.

20 ASS'D COIL FORMS, including 11 ceramic, 3 polystyrene, and 6 fiber, all useful sizes—50c.

VARIABLE CONDENSERS: 350 MMFD. 5 gang—\$1.95; 4 gang—\$1.49; 3 gang—\$3c; 2 gang—79c; 7.5 to 20 MMFD, 1750v spacing, extra long shaft Hammarlund—68c; miniature variables, 25 MMFD—39c; 50 MMFD—49c; 75 MMFD—59c; 100 MMFD—69c; 140 MMFD—70c.

FLUORESCENT LIGHT BALLASTS. Single 30 or 40 watt, \$1.60; Dual 40 watt High Power Factor—\$3.75.

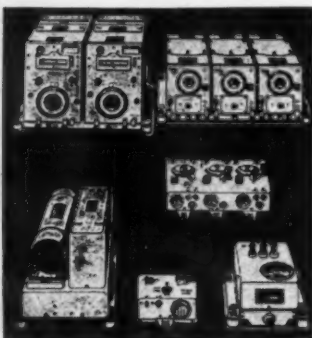
HEADPHONES—Highest quality Signal Corps headsets with 12" cord and plug \$1.25. 5' rubber covered patchcords with phone plug and socket—45c.



BC-221 FREQUENCY METERS with calibrating Crystal and calibration charts. A precision frequency standard that is useful for innumerable applications for laboratory technician, service man, amateur, and experimenter at the give away price of only \$36.95.

- Six assorted **POWER** and **AUDIO TRANSFORMERS.** All new—\$1.98
- Ten assorted **R. F. Chokes** including high frequency types—\$.35
- Five assorted **AUDIO** or **FILTER CHOKES**—\$.99
- One Hundred assorted **Resistors**—\$1.95
- Ten new **JAN CABLE CONNECTORS** including many popular types—\$.99
- Ten assorted **WIRE-WOUND BLEEDERS**, 50 and 100 Watt, many with taps—\$2.49
- Six assorted **OIL FILLED CAN TYPE CONDENSERS**, all with mounting brackets—\$1.49
- Ten assorted **METAL & BAKELITE KNOBS**—(no wooden knobs)—\$.39
- Six assorted **VARIABLE CONDENSERS**, including butterfly types—\$1.49

The above nine assortments, totaling over \$12.00 at the unbelievable bargain prices listed; can be purchased together as one lot at a super-special total price of \$9.95, a value so incredible that you will rub your eyes as you read this, our new year get-acquainted offer. All merchandise guaranteed to be as advertised.



SCR-274N COMMAND SET

The greatest radio equipment value in history.

A mountain of valuable equipment that includes 3 receivers that use plug-in coils, and consequently can be changed to any frequencies desired without conversion. Also included are two Tuning Control Boxes; 1 Antenna Coupling Box; four 28V. Dynamotors (easily converted to 110V. operation); two 40-Watt Transmitters including crystals, and Preamplifier and Modulator. 29 tubes supplied in all. Only a limited quantity available, so get your order in fast. Removed from unused aircraft and in guaranteed electrical condition. A super value at \$29.95, including crank type tuning knobs for receivers.

RT-1579 consists of a three stage (cascade 6SJ7's and 6F6 output stage) high gain, high fidelity amplifier with 60 cycle, 110V power supply on the same 13 1/2 x 14 1/2 chassis, which is protected by a substantial steel cover over tubes and parts. Made by Western Electric with typical quality components such as a husky power transformer and oil condensers, this unit is obviously intended to give years of trouble-free service with no more need for repairs than a telephone. Disconnecting one wire each, from the special input and output filters, will result in as high a fidelity amplifier as can be obtained. Your cost with tubes, diagram and parts list included—\$14.95. We also offer the **RT-1579** with a Raytheon Magnetic Voltage Regulator already installed beneath the cover. Imagine an amplifier complete with tubes, built to Western Electric quality standards, and immune to line voltage variations besides, making it perfectly suited for the most difficult industrial, circus, carnival, or commercial installations, offered for a total price of only \$19.95, our price for both units.

Westinghouse 9 Amp. R. F. METER with special linear scale—\$3.80.

Outdated **EVEREADY** 90 Volt and 1 1/2 Volt Battery Pack. This is a unit larger than an auto battery. Regular price \$12.00. Your cost \$1.49.

Outdated **BRIGHT STAR** standard flashlight cells. Carton of 48—\$1.00.

1947 Edition Editors and Engineers Radio Handbook. Regularly \$2.50, now \$1.79.

1947 Edition Amateur Radio Relay League Handbook. Regularly \$1.25, now \$.89.

We are overstocked on the following Rider's Manuals: Rider's A. C. Calculation Charts (complete coil and transformer design data). Regular price, \$7.50. Temporarily reduced to \$5.00.

Rider's Automatic Record Changers and Recorders. Regularly \$9.00, now \$5.95.

ICA 1081 **BLACK BAKELITE POINTER TYPE KNOBS.** Regular List 20c each; 25 for \$1.00.

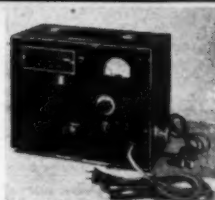
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RADIOMEN'S HEADQUARTERS *** WORLD WIDE MAIL ORDER SERVICE!!!

AT LAST YOU CAN AFFORD A LABORATORY STANDARD MICRO VOLTER

The famous Measurements Corp. Model 78B, 5 Tube Laboratory Standard Signal Generator (that sold new, FOB Boonton, N. J., for \$310.00 net) is available in perfect condition for 25 to 60 cycles, 115 V AC operation. Until now this is the sort of top-flight lab equipment that discriminating buyers have only vainly hoped would be released at a bargain price. Worth every cent the manufacturer asks, but available FOB Buffalo while our limited supply lasts for only \$79.95. Such companies as Admiral Corp. and John Meck, Inc., have ordered from us and repeated many times on these 78 generators for use in their labs and production line testing. "REMEMBER THAT A STANDARD IS ONLY AS RELIABLE AS ITS MAKER."



Model 78-B Standard Signal Generator. Two Frequency Bands between 15 and 250 megacycles.

TRANSMITTING RF CHOKES, 4 P.T.E. 350 MA.—25¢ or 5¢ for \$1.00. INTERRUPTION FREQUENCY COILS for super-regenerative receivers or the tremendously popular FM adapters for standard broadcast sets. Iron core with a resonant frequency of 50 KC—35¢; Air Core, 100 KC—25¢. 30 MC IF TRANSFORMERS, double slug tuned—25¢. VIDEO AMPLIFIER PLATE COILS—slug tuned—25¢. REMOTE CONTROL UNIT: Aluminum case 4x3x3" containing 3 potentiometers, triple pole switch, 4 knobs, gear mechanism, counter and phone jacks—59¢. MODULATION TRANSFORMERS—10 watt, metal case 98¢; 50 watt, open-type, \$1.95; 40 watt, cast aluminum case, \$2.95; Class "B" input transformers, cast aluminum case, \$1.95; Transceiver audio transformers, 65¢; Transceiver modulation transformers, 65¢. LINE FILTERS—110V—each unit contains two 2 mfd. oil filled condensers and a 15 amp. iron core choke. This filter has innumerable uses such as oil burner line filter, etc. A ten dollar value for 98¢.

\$9.95 TAKES ALL THREE BIG BARGAINS

- 1. AUDIO AMPLIFIER** Undreamed of value. Uses 6V6's. Has 4 microphone inputs brought to jacks at rear panel. Various output impedances available at rear panel connections. Steel case with chrome handles. 9" long x 9" high x 6" deep. Tubes included. New in original carton. Shipping weight 15 lbs. **SUPER SPECIAL—\$4.95** while supply lasts.
- 2. RADIO HEADSETS** Latest supersensitive type with rubber earpieces. Every pair guaranteed perfect. \$5.99 per pair OR 3 PAIRS FOR \$15.00.
- 3. HOME WORKSHOP AT BARGAIN PRICE** Accurate and precise 2 speed guaranteed hobby lathe, the essential machine for the home workshop. Sturdy enough for light production work or factory standby service. Supplied with 56" of belt for connecting to any available electric motor or power take-off, such as on a jeep or tractor. Also included in this unbelievable offer are such accessories as a 1/2" drill chuck with specially hardened tool steel jaws, a 4" electric furnace high speed grinding wheel, a cotton buffing wheel with a large supply of buffing compound, and a 4" steel wire scratch brush. Your cost \$6.00. Sole export agent. Distributor inquiries invited. **NO C. O. D.'s. ORDER NOW—DON'T DELAY**

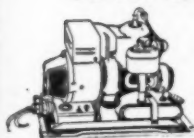
RT1463 7 tube amplifiers containing 3—7B7, 1—7Y4, 3—7N7, 4 potentiometers, numerous resistors, filter and bypass condensers, filter chokes, power and audio transformers, and six sensitive plate relays. A military development that provided amazing stepless control proportional to correction required, for allersons, rudder and elevator, in the original application. A control amplifier of the ordinary type would deflect the rudder by some arbitrary amount when the ship was blown off the course to port or starboard. The result would either be that the correction was insufficient and the plane continued off course, or the correction would be too great, starting a series of lurches that would greatly increase fuel consumption and elapsed time in reaching the objective. This phenomenal unit, with its 3 amplifiers and six 5000 ohm relays in bridge circuits, will accurately control any 3 operations, related or unrelated, in minutely adjustable uniquely quantitative variations in either forward or reverse directions. 9"x7"x5" black crackle aluminum case. Brand new in original carton \$12.95, or used \$9.95.

SCR-284 TRANSMITTER-RECEIVER—This medium power transmitter and the accompanying 7 tube very sensitive receiver are naturals for 80 or 40 meter operation (phone or CW), on either fixed stations or mobile applications. These units are brand new and come complete with 17 tubes, key, microphone, 200 KC calibrating crystal and instructions and diagrams for use with up to 100 watts input to the final stage on 40 or 80 meters for either phone or CW, using vehicle or 110 Volt power supply. Your cost.....\$39.95

GENERAL ELECTRIC RT-1248 15-TUBE TRANSMITTER-RECEIVER

TERRIFIC POWER—(20 watts) on any two instantly selected, easily pre-adjusted frequencies from 435 to 500 Mc. Transmitter uses 5 tubes including a Western Electric 316 A as final. Receiver uses 10 tubes including 955's, as first detector and oscillator, and 3—7HT's as IF's, with 4 slug-tuned 40 Mc. IF transformers, plus a 7HT, 7BE's and 7BT's. In addition unit contains 8 relays designed to operate any sort of external equipment when actuated by a received signal from a similar set elsewhere. Originally designed for 12 volt operation, power supply is not included, as it is a cinch for any amateur to connect this unit for 110V AC, using any supply capable of 400V DC at 135 MA. The ideal unit for use in mobile or stationary service in the Citizen's Radio Telephone Band where no license is necessary. Instructions and diagrams supplied for running the RT-1248 transmitter on either code or voice, in AM or FM transmission or reception, for use as a mobile public address system, as on 80 to 110 Mc. FM broadcast receiver, as a Facsimile transmitter or receiver, as an amateur television transmitter or receiver, for remote control relay bookups, for Geiger-Mueller counter applications. It sells for only \$29.95 or two for \$53.90. If desired for marine or mobile use, the dynamotor which will work on either 12 or 24V DC and supply all power for the set is only \$15.00 additional.

PE-109 32-VOLT DIRECT CURRENT POWER PLANT



This power plant consists of a gasoline engine that is direct coupled to a 2000 watt 32 volt DC generator. This unit is ideal for use in locations that are not serviced by commercial power or to run many of the surplus items that require 24-32V DC for operation. The price of this power plant is only \$59.95. We can also supply a converter that will supply 110v AC from the above unit or from any 16-32V DC source for \$29.95.

ARMY BC-312 COMMUNICATIONS RECEIVER

This receiver covers the frequency range of 1.5 MC to 18 MC in six direct reading bands. The dial, that is driven with split gears to prevent backlash, has 4500 logging divisions per band with approximately 600 divisions on the 20 and 40 meter ham bands and 1000 divisions on 80 meters. Two stages of RF before the converter in this set give it a very high signal to noise ratio and maximum sensitivity. Outstanding features of this receiver are: BFO with pitch control, send-receive relay, jacks on the front panel for headphones and speaker output, and mike and key inputs. All tubes are standard 6 volt types. This receiver was designed to withstand rough usage in the field and for operation from vehicles while in motion, so it is ruggedly constructed and contains a dynamotor power supply—Your cost—\$49.95. Conversion kit to 110V AC is available for \$6.50.

TRANSFORMERS—All types in stock. **AUTO-TRANSFORMERS**: Steps up 110v to 220v, or steps down 220v to 110v—\$1.95. **FIL. TRANS.**: 6.3v, 20 Amps.—\$1.99; Universal Output Trans. 8 Watt—89¢; 18 Watt—\$1.29; 30 Watt—\$1.59. **AUDIO TRANSFORMERS**: S. Plate to S. Grid. 3:1—79¢; S. Plate to P.P. Grids—79¢; Heavy Duty Class AB or B, P.P. inputs—\$1.49; Midget Output for AC-DC sets—69¢; **MIKE TRANSFORMER** for T-17 Shure microphones, similar to UTC omcner type—\$2.00. **Stancor SR or DB** mike to line or grid—\$1.95. **POWER TRANSFORMERS**—Half-shell types, 110V, 60 cy. Centertapped HV winding. Specify either 2.5 or 6.3V filament when ordering. For 4-5 tube sets—850V, 40MA, 5V & 2.5 or 6.3V.....\$1.49 For 5-6 tube sets—850V, 45MA, 5V & 2.5 or 6.3V..... 1.75 For 6-7 tube sets—875V, 50MA, 5V & 2.5 or 6.3V..... 1.90 For 7-8 tube sets—700V, 70MA, 5V & 6.3 or two 2.5V..... 2.35 For 7-8 tube sets—700V, 70MA, 5V & 6.3 (25 Cycle)..... 3.60 For 8-9 tube sets—700V-90MA, 5V-2A, 2.5V-3.5A, 2.5-10.5A..... 2.85 For 9-11 tube sets—700V, 5V & 6.3V-4A..... 2.85 For 9-15 tube sets—600V, 150MA, 5V & 6.3V..... 2.95

CONDENSERS—PAPER TUBULAR 600 WV.—.001, .002, .005 —.01, .05—.05—.1—100—.25—250—.5—350; ELECTROLYTICS: 8mfd 200v—28¢; 16mfd 35v—20¢; 30mfd 150v—23¢; 20/20mfd 150v—35¢; 30/20 150v—46¢; 50mfd 150v—43¢; 8mfd 475v—34¢; 16mfd 350v—65¢; **OIL CONDENSERS**: 4mfd 600v 40¢; 2mfd 600v. 29¢ 3X.1mfd 600v—29¢.

FILTER CHOKES: 200, 300, 400, 500 ohm light duty—39¢; 200 or 300 ohm heavy duty—99¢; 250 ma 35 ohm, made for U.S. Navy, fully shielded—\$1.95; 75 ohm 125 ma—25¢ or 25 for \$4.25; "Meissner type" tapped filter chokes—25¢; 8 amp. iron core A filter—25¢; Choke-condenser combination, ideal to replace any size speaker field when installing PM speaker—79¢. **SOCKET WRENCH SET** consisting of 5 sockets ranging in size from 5/16 to 1/2" and a handle—79¢. **AUTOMATIC WIRE STRIPPERS** will strip up to 1000 wires per hour, a handy tool for any service job—\$3.52. **Six Foot Asbestos Insulated Flat Iron Cord**, one end has a male plug, the other end has a standard flat iron socket. Your price—50¢ each or 10 for \$4.

5" "SO" RADAR P.P.I. OSCILLOSCOPE, complete with 9 tubes. This unit contains magnetic deflection yokes, Selsyn motor, and self-contained 110 V. power pack designed to run on the AC supply on LST and PT boats. Various ranges from 2 to 80 miles. The most satisfactory scope available for navigational radar or panoramic television applications. Uses 807 tube in final power stage that provides yoke deflecting current. Your cost, \$39.95.

"SO" RADAR ECHO BOXES. The perfect calibrated cavity wavemeter—\$10.00. **LORAN INDICATOR OSCILLOSCOPE**, including 26 tubes with 5" cathode ray tube. Govt. instruction manual supplied with each of these—\$39.95. **3" OSCILLOSCOPE**, complete with tubes and brand new—\$9.95.

CLOSING OUT

THE FOLLOWING DESIRABLE ITEMS IN "AS IS" CONDITION AT SACRIFICE PRICES TO MAKE ROOM IN OUR WAREHOUSE FOR INCOMING STOCK

947A ONE KILOWATT HIGH FREQUENCY TRANSMITTER

This relay-controlled transmitter includes a 115V, 60 cycle power supply, protected by 8 magnetic circuit breakers, that alone is worth more than the price we are asking for the whole rig, even on today's surplus market. On the front panel are six 3 1/2" GE or Weston meters, including 250 MA, 50 MA, 1000 MA, 150 V AC, and 1500 V DC at 1000 ohms per volt for 5 screens and plate. The rack-type 21"x15"x36" unit contains six amplifier and rectifier tubes aggregating over \$60.00 at WAA current wholesale prices. Western Electric's price to the Government was \$1500.00. Shipping weight, 500 lbs. Your cost at close-out price.....\$39.95

BC-412 5" RADAR OSCILLOSCOPE

Easily converted to a first class lab. scope or to an excellent home television receiver using the instructions in the August, 1947, RADIO NEWS. Furnished with a brand new 5BP4 tube for the television application or a brand new 5BP1 for the scope application. Specify your choice. Sold at close-out price.....\$29.95

5 INCH RECEIVER INDICATOR SCOPE

This unit, originally sold by Western Electric for \$2500.00, includes a 15-tube receiver with 7 IF stages; 2-tube multivibrator sweep generator; 3-tube sweep amplifier; video amplifier; pedestal impulse and sweep generator; and 115 volt, 60 cycle supply with 2x2 for high voltage. Equipped with more than 15 tubes of the 43 originally used and including a brand new scope tube in original carton. Makes a wonderful laboratory instrument and is better adapted for television than any other war surplus unit. Reduced close-out price.....\$39.95



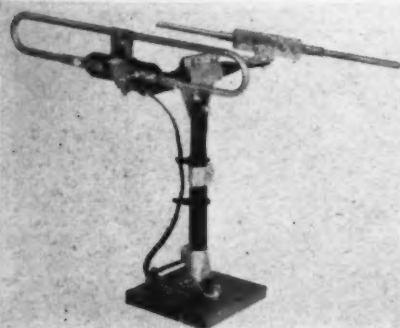
BUFFALO RADIO SUPPLY, 219-221 Genesee St., Dept. IN, BUFFALO 3, N. Y.

CABLE ADDRESS BUFRAD

What's New in Radio

DIPOLE ANTENNA

The Ward Products Corporation of Cleveland has designed a new point-of-purchase display designed to merchandise the company's line of "Magic



Wand" antennas for FM and television.

Included in the line are a choice of straight or folded dipoles for either the 88 to 108 mc. FM band or the 44 to 88 mc. television band. A reflector kit is available with any of these models to assure maximum direction gain and to eliminate interfering reflections.

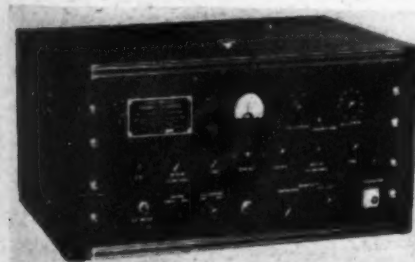
The Ward Products Corporation, 1523 East 45th Street, Cleveland 3, Ohio, invites inquiries about this line and the new display unit.

THERMISTOR BRIDGES

Two new thermistor bridges which provide r.f. power measurement up to two milliwatts at frequencies up to the shorter microwave regions have been announced by the Electronics Division of Sylvania Electric Products Inc.

The Type 7BN-7SE is designed for continuous duty at normal laboratory ambient temperatures where measurement in S, X, and K microwave bands may be made with suitable r.f. measuring heads. The bridge is independent of frequency but should be used with appropriate thermistor mount, according to the manufacturer. Two milliwatt scale sensitivity is essentially linear but a calibration curve is required for each r.f. head used.

The Type TBN-6SE bridge requires an external oven and thermistor



mount. It contains a Wheatstone Bridge circuit with three precision re-

sistor arms and externally mounted thermistor; a stabilized 2000 cycles source for the bridge; stable d.c. source for substitution measurement of r.f. power; and an amplifier. It is independent of frequency and can be used as a balanced or unbalanced bridge, providing accurate full scale meter readings from 20 microwatts to 2 milliwatts.

The Electronics Division of Sylvania Electric Products Inc., 500 Fifth Avenue, New York 18, New York, will furnish full details on request.

SIGNAL GENERATOR

Coastwise Electronics Co., Inc., has added a new piece of test equipment to its already extensive line of instruments for the serviceman.

The newest addition to the line is the "Ferret" Model 701 signal generator which provides a range of from 170 kc. to 110 mc. on fundamentals. This instrument is especially suitable for use in servicing FM-AM and television receivers. The unit is crystal calibrated and uses low-loss permeability tuned coils. The signal generator provides a 400-cycle sine wave internal modulation from 0 to 100 per-cent, calibrated on the dial, and 20 to 10,000 cycle external modulation for frequency response measurements.



Full details on the "Ferret" Model 701 signal generator and other test equipment in the "Ferret" line will be supplied by Coastwise Electronics Co., Inc., 130 North Beaudry Avenue, Los Angeles 12, California.

"ELECTRONAMIC TEST MASTER"

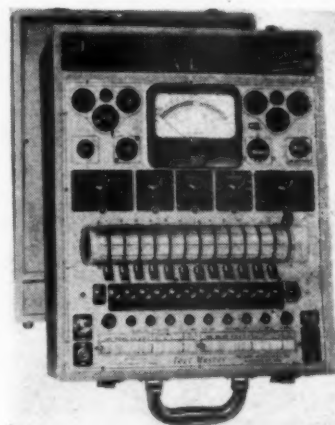
Precision Apparatus Co., Inc. of Elmhurst, Long Island has just added a new unit to its line of test equipment, the Series 10-20 "Electronamic Test Master."

The new instrument includes the company's exclusive "Precision Electronamic Tube Performance Test Circuit" plus a complete push-button operated a.c.-d.c. set tester. The special circuit subjects tubes under test to appropriately phased individual element potentials which are swept over a complete path of operation, on a sinusoidal time base, encompassing

a wide range of plate family characteristic curves. The indicating meter reads directly "Replace," "Weak," and "Good."

The circuit features direct facilities to accommodate up to 12 elements and tests all standard receiving and low power transmitting tubes, including acorns, Noval 9 pins, dual capped h.f. amplifiers, etc.

The set tester has 34 a.c. and d.c.



ranges, plus complete radio "A," "B," and "C" battery test facilities.

For additional information write direct to Precision Apparatus Co., Inc., 92-27 Horace Harding Blvd., Elmhurst, Long Island, New York.

TV ANTENNA

LaPointe-Plascomold Corp. of Unionville, Conn., has just developed a new television antenna which is said to provide twice the present range of reception available with the usual TV antennas.

Known as the "VEE-D-X" antenna, this unit is capable of providing, by direct reception, clear signals at distances up to 125 miles from the television transmitter, according to the manufacturer.

The new unit has a high forward gain, thus providing maximum pickup in one direction while having minimum pickup from the sides and rear, helping to eliminate interference. A matching section has been incorporated in the new antenna which permits matching the impedance of the transmission line which may be from 50 to 600 ohms, with that of the antenna, thus helping to prevent ghosts and other undesirable characteristics caused by mismatching.

While the antenna is fundamentally broadband in its characteristics, it may be adjusted in those areas where more gain is desired at some slight decrease in bandwidth.

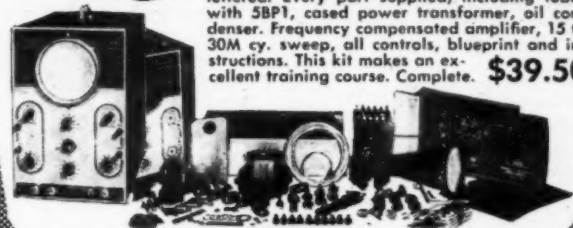
Connections to the antenna are made by means of coaxial connectors or



THE NEW

HEATH 5" OSCILLOSCOPE

Complete kit to build a beautiful 5" scope, cabinet, chassis and panel punched, formed and lettered. Every part supplied, including tubes with 5B1, cased power transformer, oil condenser. Frequency compensated amplifier, 15 to 30M cy. sweep, all controls, blueprint and instructions. This kit makes an excellent training course. Complete. **\$39.50**

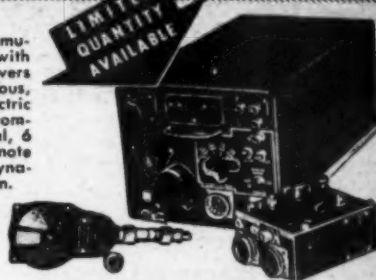


ECA RECEIVER MODEL ARB

A brand new Navy communications type receiver with BROADCAST BAND. Covers 200 KC to 9.1 MC continuous, has two RF stages, electric motor band switching, complete with calibrated dial, 6 tubes, control head, remote control box, 24 volt dynamotor, and circuit diagram.

\$29.50

LIMITED
QUANTITY
AVAILABLE



OIL FILLED CONDENSERS

CAP	WVDC	PRICE	CAP	WVDC	PRICE
5	400	\$.39	1.	1000	.49
5-5	400	.79	2.	1000	.69
4	400	.49	4	1000	.90
5	600	.59	8	1000	1.00
8	600	1.00	8-8	1000	1.95
2.5-2.5-5	600	1.50	.25	1500	.49
5-5-5	600	1.95	1.5	1500	.79
8-8-8-8	600	3.95	.1	3000	1.20
5-5	600	1.00	.25	3000	1.30
.1	1000	.29	.05	7500	2.50
.25	1000	.39			

BC 438 FREQUENCY METER



Only 40 available

A beautifully constructed frequency meter, built by Link for Western Electric, 5 tube, AC OPERATED, covers 195 to 215 MC, comes complete with tubes, standard crystal, calibration chart, circuit diagram, in used condition. The excellently filtered 110V AC power supply alone worth our price of..... **\$8.95**

OIL FILLED BATHTUB CONDENSERS

200 Volt in .5, .1, dual .5 MFD..... 20 for \$1
400 Volt in .1, dual .1, triple .1, .2, .25, .5, 1, MFD..... 15 for \$1
600 Volt, .1 dual .1, triple .1, .25 dual .25, .5, 1..... 10 for \$1

BRAND NEW ARMY AIR FORCE ASTROGRAPH



The case of this unit makes the finest tool and service kit ever designed. Plywood construction, 14x 11x10" high, with 8 covered compartments in the bottom for repair parts, leather handle, steel reinforced covers, hinged lid. Also excellent as case for radio phonograph, movie projector, camera, shell case, fishing kit, picnic kit, etc. The astrograph itself, (which cost the government \$125.00) makes an excellent contact printer, and can be used as a foundation for enlarger, strip map holder, etc. The case alone worth twice the give-away price of..... **\$3.95**

PUSH BUTTON TUNER

This beautifully constructed unit was used on an Army FM receiver. A ten push-button assembly operating four gang silver plated tuning condenser drum dial manual tuning. Brand new. Shipping weight, 10 lbs. **\$2.50**



SPECIALS

Selsyn Indicators 5" Brand New \$2.95
PE 104A power supplies operate from 6 or 12 volt input — output 84V plate 1.4 volt filament \$4.95
Ceramic Variable Condensers 50 MMF screw driver adj. Special 5 for \$1.00
Lip Microphones T-45 in original sealed cartons \$1.00
Thermocouples for RF Ammeters, 3 for \$1.00
10 henry 50 ma Filter Chokes 2 for \$1.29
5B1 Cathode Ray Tubes \$2.49
5B1 Socket79
Synco Motors 55DG Brand New, per pair \$6.95
Kit of Screw Driver Type Potentiometers 10 for \$1.00
Kit of Metal Tubular Bypass Condensers 20 for \$1.00
Kit of Relays, excellent types 5 for \$2.50

BC 306 ANTENNA

TUNING UNIT

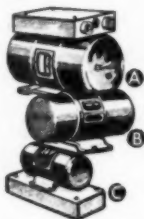
GE unit from BC 375 matches 150 watt transmitter to antenna. Brand new..... **\$2.95**



DYNAMOTORS

Consists of electric motor operating generator on same shaft. Many applications — operating radios from storage battery — using as motor.

Dynamotor A — Input 12 volts, output 1000 volts at 350 MA, **\$7.95**
Shipping weight, 72 lbs.
Dynamotor B — Input 6 or 12 volts, output 350 volts, 160 MA. **\$5.95**
Shipping weight, 30 lbs.
Dynamotor C — Input 28 volts, output 220 volts at 60 MA. **\$1.50**
Shipping weight, 6 lbs.



BC 457A TRANSMITTER

Brand new transmitters covering 4-5.3 MC. Contains M.O. 1625, two 1625's as P.A., these make excellent VFO from conversion in May 1946 CQ. Complete in original cartons with tubes..... **\$4.95**



ELECTRONIC KIT

Experimenter's paradise. Five lbs. of new condensers, transformers, coils, switches, sockets, resistors, selenium rectifier, earphones, etc. Parts for dozens of experiments. Shipping weight, 6 lbs. **\$1.00**



MINIATURE HEADPHONES

Miniature type headphones. Ideal for hearing aids, listening to radio in bed, etc. Complete with headband, cord and two sets rubber ear plugs. Shipping weight, 1 1/2 lbs. ONLY **\$1.00**



RG-8/U FLEXIBLE COAXIAL CABLE



Only **4¢** PER FT.

Ideal for feeding any antenna up to 1 K.W. All frequencies up to 250 MC. Brand new any length. Lowest price ever offered.

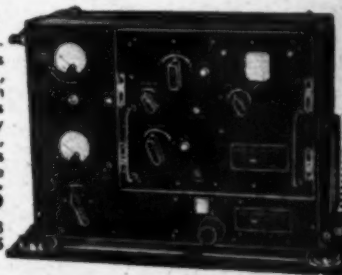
TUNING UNIT

The heart of the Army Walkie Talkie. Contains transmitter crystal and tank coil, receiver coil, tuning condenser and crystal; ideal foundation for small set. Shipping weight, 1 lb. **\$1.00**



BC 223 TRANSMITTER

One of the most desirable military transmitters, 4 crystal-controlled frequencies and master oscillator. Meters for Osc., Ant., and total current. Uses 46 speech amplifier, 2-46 modulators, 801 each as oscillator and power amplifier. Practically no conversion necessary: plug in crystal, mike and connect power supply and it's ready to operate. Brand new with one tuning unit and circuit diagram. (less tubes) **\$12.95**
Vibrator Power Supply PE 125 for BC 223 (12 V. operation) new..... **\$9.95**



NO ORDERS UNDER \$2. • • WE WILL SHIP C.O.D.



The HEATH COMPANY

BENTON HARBOR, MICHIGAN

January, 1948

screw terminals, depending on the type of transmission line used. The entire assembly may be erected by one man without technical knowledge in about a half-hour. The assembly weighs about 25 pounds and may be mounted in the end of a short length of 2 inch pipe or other structure which may then be affixed to the house.

Complete details on the "VEE-D-X" antenna will be supplied upon request to LaPointe-Plascomold Corp., Unionville, Conn.

"HOMEFONE" INTERCOMS

Homefone Corporation of Pasadena has introduced a new line of intercoms designed for the home and available in either custom or standard models.

According to the company, the installation of the "Homefone" system permits the user to call and receive a direct response from any point, monitor any point desired where safety is a factor or hazards exist, transmit radio programs or music from any location to another, relay telephone calls, act as a burglar detection device, make emergency calls to the entire household, answer the door or remotely located gatehouses, and provide secret two-way conversations when desired.

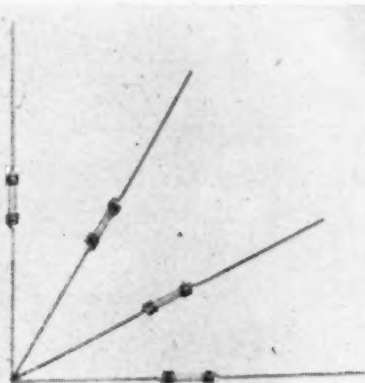
The equipment is manufactured in two styles, flush wall units or cabinet style units finished in walnut with mahogany panels.

A catalogue covering some of the

company's standard and custom line of units is available for the asking. Address your request to Homefone Corporation, 24 South Oak Knoll, Pasadena 4, California.

FUSE RESISTORS

International Resistance Co. of Philadelphia has developed a new wire-wound resistor which performs two



functions, that of a resistor and that of a fuse.

The difference between these two functions is one of power level. At a relatively low level the unit functions as an ordinary resistor, at a higher power level it functions as a fuse and opens the circuit when the wire burns out.

This new resistor, which has been designated as the type OWA, is cus-

tom-built to individual circuit requirements and is available in RMA values from 15 to 150 ohms. Power rating is one watt.

Inquiries on this new fuse resistor will be answered promptly by International Resistance Co., Phila., Pa.

COMMUNICATIONS RECEIVER

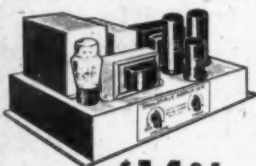
National Company Inc. of Malden, Massachusetts, has recently brought out the newest of the HRO line of communications receivers, the HRO-7.

This new, custom-built receiver has been thoroughly modernized with the time-proven features of the HRO series retained and new laboratory circuit features added.

The HRO-7 includes automatic, adjustable-threshold noise limiter for use on c.w. or phone; improved high-frequency oscillator; voltage regulator; front-of-panel tone switch; lever-type handles for coil sets; slide-rule type calibration on coil sets; bandspread on 11 meter band; accessory connector socket; and a radio-phonograph switch. The circuit employed on all bands of the HRO-7 is made up of two tuned stages of r.f. amplification, a tuned first detector, a high-frequency oscillator employing a tube separate from the first detector tube, two stages of i.f. amplification operating at 456 kc., a combined second detector-automatic volume control stage, an automatic adjustable-threshold series valve noise limiter, a first audio

(Continued on page 157)

HEATHKIT AMPLIFIER KIT



\$14.95

Build this beautiful push pull 25 Watt amplifier and save two-thirds of the cost. Every part supplied. RCA power transformer, oil filled condensers, 4 tubes (one dual type). Tone control, output transformer, etc., excellent fidelity, phase inverter, and chassis punched and formed. This amplifier is ideal as public address set or high quality phonograph radio amplifier. Add postage for 20 pounds.

HEATHKIT TRANSMITTER KIT



Complete KIT
\$19.50

A best buy in an amateur transmitter kit. Circuit uses latest post war improvements, can be assembled to cover 80-40-20-10 meters with 25 Watt output. Comes complete with 80 meter crystal, speech amplifier, 80 meter coil, four tubes, cabinet, beautiful panel and all additional parts needed less power supply. Blueprints and instructions included. Power supply kit \$10.00 additional. Add postage for 20 pounds, 8 pounds for power supply.

SCR-269F AIRCRAFT RADIO COMPASS

Brand new SCR-269F compass, complete less inverter at less than WAA wholesale. Complete in original cartons.

\$34.95



HEATHKIT SIGNAL GENERATOR KIT



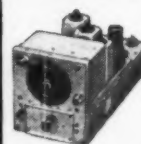
Complete kit to build a fine service instrument. Supplies fundamentals 150 KC to 30 MC. Complete with beautiful panel, cabinet, tubes, controls, coils, blueprints and instructions. Supplies RF, modulated R.F., and AF. Build it yourself and save two-thirds the cost. Add postage for 8 pounds \$19.50

T32 TABLE MICROPHONE

One of the Army's best. Built by Kellogg, ideal for factory call system, public address, amateur use. Brand new in original cartons, add postage for 5 lbs. \$2.95



COMMAND SET ACCESSORIES



110V power supply kit with 24 volt filament, no wiring changes inside set, punched chassis and volume control \$5.95
5" PM speaker with output transformer, matching head-phone output \$2.80
Dual receiver rack FT 277A with connecting plugs \$1.00
Shock mount for above rack \$1.00
Single transmitter rack \$1.00

TRANSFORMERS AND CHOKES

We are preparing a catalog listing over 100,000 transformers. Write for list. Thousands as low as 25c each.

AN/APN-1 RADIO ALTIMETER

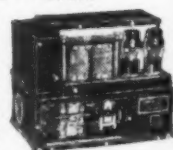
Brand new complete units at less than WAA wholesale, supplied with antenna plugs, indicator, switch, etc., limited quantity available, in original cartons \$39.50



TS-16 APN Test sets sold only with quantities of 50 or more altimeters, each \$89.50

PE-125 AX POWER SUPPLY UNIT

Companion power supply unit to the BC-223 transmitter and BC-312 receiver. Supplies 500V at 160 MA from either 12 or 24 volt input. A beautiful unit, complete with relays, fuses, filters etc. Brand new, in original crates \$9.95



The HEATH COMPANY
BENTON HARBOR, MICHIGAN



WORLD'S FINEST SURPLUS BARGAINS..



THE NEW HEATH VACUUM VOLTMETER

The most ever offered in kit form. Applied: all and former.

BUILD IT YOURSELF AND SAVE 2/3 COST

\$2

TELEVISION CONDENSER

Aerovox hyval .05 MFD at 7500 volts. Limited quantity. **\$2.50**



OUR BEST CONDENSER BUY

An ideal power supply filter has 2.5 MFD., 2.5 MFD., and 5 MFD., sections at 600 V. working. All oil filled, extra special. **95c**

CONDENSER SPECIAL

Brand new Cornell-Dubilier 2 MFD. 600 V. oil filled filter condensers, porcelain insulators. **3 FOR \$1.00**



G.E. CIRCUIT BREAKER

Protect your equipment at one-fourth of cost, new G.E. 50 amp. 220 V. circuit breakers. **\$2.95**



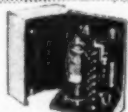
4 Gang CONDENSER

A silver plated 147 MFD. per section variable tuning condenser — long 1/4" shaft, an outstanding surplus buy. **\$1.00**



AIRCRAFT INTERPHONE AMPLIFIER

New BC 347C using 6F8 tube with tube socket, transformers, diagrams, etc. **\$2.95**



2 1/2" VOLTMETER

Ideal for making pocket tester, scale 0-3 D.C. volts, made by Weston and Simpson. Tester diagram and Multiplier Resistors for 30-300 V. D.C. included. **\$1.95**



MILITARY CONVERSION POWER TRANSFORMER

Especially for 24 volt receivers. Supplies 500 volts C.T. at 50 MA, 5 V. at 2A. and 24 V. at 1/2 amp. To convert command sets without rewiring. **\$2.95**



PUSH BUTTON RECEIVER

An excellent portable push button permability tuned receiver covering 2-5 Mc. Easily converted to broadcast band, operates from 2 or 6 volts with six tubes. PM speaker — two vibrator power supplies slightly used. Only 100 available.

\$14.95

BC 733 RECEIVER

A Western Electric 10 tube receiver cover 100-120 Mc. complete with 10 tubes, crystals, etc. Used condition.



\$7.95

NO ORDERS UNDER \$2.00 WE WILL SHIP C.O.D.

BC 645

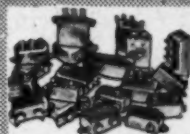
GENERAL ELECTRIC TRANSMITTER-RECEIVER

A beautiful brand new transceiver operating in the 450-500 Mc range. Comes with 15 new tubes (list price tubes alone \$58.00) and all conversion data and diagrams. Covers 420-450 ham band, citizens two way communications band, mobile ham band, and Exp. television band. Cost government over \$400.00. Our price complete.

\$14.95 2 FOR \$27.00



FREE 120 Throat Microphone with each order over \$10.00



BATHTUB CONDENSER KIT

.1 MFD. to 1. MFD. up to 600 Volt.

20 FOR \$1.00

TRANSMITTER CRYSTAL KIT

4 mounted crystals between 2 MC and 3 MC.

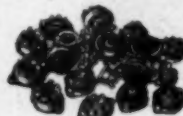
4 FOR \$1



SOCKET KIT

20 beautiful octal, lctal and miniature sockets.

20 FOR \$1



R.F. CHOKE KIT

Perfect sizes from 1/2 to 2 1/2 MH.

10 FOR \$1



POWER RHEOSTAT KIT

All knob types in 25 and 50 watt I.R.C., etc.

5 FOR \$2.95



MICA CONDENSER KIT

An excellent assortment with silver mica and regular. All color coded or marked.

25 FOR \$1.00



CERAMIC CONDENSER KIT

20 beautiful condensers all marked or coded, many zero temp. coef. types.

20 FOR \$1.95



RESISTOR KIT

The best available all insulated color coded in 1/2-1-2 watt sizes.

100 FOR \$1.95



The HEATH COMPANY

BENTON HARBOR, MICHIGAN



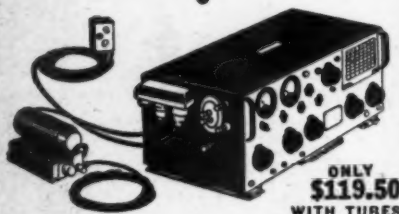
BRAND
NEW

ONLY
A FEW
STILL
ON
HAND

**25-Watt Re-entrant Speaker with
Jensen Driver Unit and UTC Line-
Matching Transformer**
IN ORIGINAL, SEALED FACTORY
CARTONS

Only \$21.60 Net

• We have just received our final shipment of this outstanding PA Speaker. First shipment sold out in a few days. Stock up now. You will not be able to buy this Army Surplus item in future. Specifications: 20" overall. Horn 13" dia. Metallic diaphragm voice-coil assembly (Jensen). Driver unit alone weighs 9 lbs. UTC Line-matching Transformer 250, 500, 1000 and 2500 ohms. Speaker is fitted with mounting swivel, lock-nut and sleeve for attachment to standard pipe stand. Unquestionably one of the best surplus buys ever offered.



ONLY
\$119.50
WITH TUBES

Collins Art-13 Transmitter

• Looks just like new. Perfect Operating Condition. We have the finest lot of these sets ever sold as surplus. Range 2000-18,000Kc. in 10 channels, voice and CW or MCW. 100 Watts Output on Fone. This famous Auto-Tune Xmtr is sold complete with Tubes, Dynamotor, Control Box and Cable Connectors. OUR PRICE.....\$119.50 Net
YOU GET LESS IF YOU PAY LESS!!!

BC-221 Frequency Meter, with A-C Power Supply Kit and Modulation Kit and Circuit Diagram



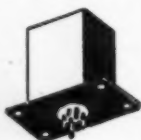
Now—AT LAST—you can get a BC-221 Frequency Meter with a complete kit of parts for an A-C Power Supply, plus another kit of parts for a Modulator, for about half the former price of a complete modulated instrument. You can convert the BC-221 Frequency Meter in a jiffy—and use it for receiver aligning, etc. Wiring diagrams are included with each kit. This may be your last chance to buy the BC-221. PRICES: BC-221 Frequency Meter with tubes, crystal and calibration charts, \$39.95. A-C Power Supply Kit and Diagram, \$5.85. Modulation Kit and Diagram, \$2.50. Any item sold separately if desired.

EXTRA-SPECIAL FOR 30 DAYS

TOBE DUAL

8 Mfd, 600 W. V. Oil-
filled Condenser, 98c

Famous Tobe "Filterette"
Paper Capacitor—Oil Impreg-
nated. Two 8 mfd. Sections
with Common Center. Metal Can. Bottom of Can
has 4-Prong Plug for Standard Tube Socket Plug-
in Connection. Rare Bargain. Brand New.



ONLY 98c

BC-645—Special... \$9.85

COMPLETE WITH 15 TUBES

4-Hour Mail-Order Service. Write for FREE 1947
Catalog.

OFFENBACH & REIMUS CO.

372 Ellis St. San Francisco 2, Calif.
Telephone—ORdway 3-8551

Parts Lists

(FOR CIRCUIT DIAGRAMS APPEARING ON PAGES 74 AND 75)



ZENITH MODEL 5G0032Z

Part No.	Code and Description
63-634	R ₁ —180,000 ohm, 1/4 w. res.
63-379	R ₂ —220 ohm, 1/4 w. res.
63-646	R ₃ —33,000 ohm, 1/4 w. res.
63-296	R ₄ —220,000 ohm, 1/4 w. res.
63-600	R ₅ —2.2 megohm, 1/4 w. res.
63-1349	R ₆ —Vol. control & sw.
63-976	R ₇ —15 megohm, 1/4 w. res.
63-271	R ₈ —1 megohm, 1/4 w. res.
63-1097	R ₉ —870 ohm, wirewound 1 w. res.
63-1366	R ₁₀ —Zipohm
63-1363	R ₁₁ , R ₁₂ —2-section Candohm res.
63-439	R ₁₃ —2700 ohm, 1/4 w. res.
63-1099	R ₁₄ —33 ohm, wirewound 1/2 w. res.
63-627	R ₁₅ —180 ohm, 1/4 w. res.
63-602	R ₁₆ —4.7 megohm, 1/4 w. res.
22-1430	C ₁ —Two-section var. cond. (Chassis 5C40-40Z)
22-1653	C ₁ —Two-section var. cond. (Chassis 5C40Z)
22-162	C ₂ —0001 μfd., 300 v. cond.
22-829	C ₃ —05 μfd., 200 v. cond.
22-827	C ₄ —1 μfd., 200 v. cond.
22-492	C ₁₁ —002 μfd., 600 v. cond.
22-470	C ₁₂ —00013 μfd., 600 v. cond.
22-196	C ₁₃ —01 μfd., 600 v. cond.
22-326	C ₁₄ —003 μfd., 400 v. cond.
22-1014	C ₁₅ , C ₁₆ —20/20 μfd., 150/150 v. elec. cond.
22-1081	C ₁₇ , C ₁₈ —40/20 μfd., 150/25 v. elec. cond.
22-1017	C ₁₉ —05 μfd., 200 v. cond.
95-937	T ₁ —First i.f. trans.
95-938	T ₂ —Second i.f. trans.
S-11999	L ₁ —Cabinet back & Wave-magnet assembly
S-11830	L ₂ —Osc. coil assembly (Chassis 5C40-40Z)
S-13765	L ₃ —Osc. coil assembly (Chassis 5C40Z)

MAJESTIC MODELS 88452, 88473

Part No.	Code and Description
9-222	R ₁ —22,000 ohm, 1/4 w. res.
9-186	R ₂ —22,000 ohm, 1 w. res.
9-17	R ₃ —10,000 ohm, 1/2 w. res.

9-272
9-255
9-177
9-226
9-227
9-213
9-234

9-225
13-15

14-4
9-220
9-107
9-95
9-180
9-183
9-296
9-299
8-35

5-39
6-177

8-36

8-33

7-22 or 7-23
6-159
5-74
8-41

5-77

6-132

6-151
6-133

5-57
5-40
5-79

19-16

6-232

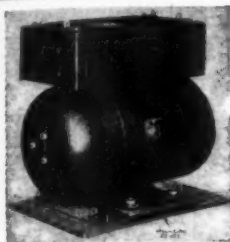
3-165
3-166
2-12
22-8-2
3-120
3-118

R₁—180 ohm, 1/2 w. res.
R₂, R₃—1 megohm, 1/4 w. res.
R₄—56,000 ohm, 1/2 w. res.
R₅—47,000 ohm, 1/4 w. res.
R₆—470,000 ohm, 1/4 w. res.
R₇—10 megohm, 1/4 w. res.
R₁₀, R₁₁, R₁₂, R₁₃—470,000 ohm, 1/2 w. res.
R₁₄—18,000 ohm, 1/4 w. res.
R₁₅—2 megohm vol. control & sw.
R₁₆—2 megohm tone control
R₁₇—220,000 ohm, 1/4 w. res.
R₁₈—2200 ohm, 1/2 w. res.
R₁₉—18,000 ohm, 1/2 w. res.
R₂₀—22,000 ohm, 1/2 w. res.
R₂₁—390 ohm, 2 w. res.
R₂₂—2.2 megohm, 1/4 w. res.
R₂₃—15,000 ohm, 2 w. res.
C₂, C₃, C₄—2.3-30 μfd. trimmer cond.
C₅, C₆—1 μfd., 200 v. cond.
C₇—6900 μfd., 300 v. mica cond.
C₈—1.5-15 μfd. trimmer cond.
C₉—330-960 μfd. padder cond.
C_{10a}, C_{10b}, C_{10c}—Tuning cond.
C₁₁—47 μfd., 300 v. cond.
C₁₂—01 μfd., 600 v. cond.
C₁₃, C₁₄, C₁₅, C₁₆—Dual trimmer cond.
C₁₇, C₁₈—05 μfd., 600 v. cond.
C₁₉, C₂₀, C₂₁, C₂₂, C₂₃—01 μfd., 400 v. cond.
C₂₄, C₂₅—220 μfd. mica cond.
C₂₆, C₂₇—006 μfd., 400 v. cond.
C₂₈—01 μfd., 200 v. cond.
C₂₉—05 μfd., 200 v. cond.
C₃₀, C₃₁, C₃₂—001 μfd., 600 v. cond.
C₃₃, C₃₄—16/16 μfd., 450/450 v. elec. cond.
C₃₅—100 μfd., 300 v. mica cond.
T₁—First i.f. trans.
T₂—Second i.f. trans.
T₃—Power trans.
L₁—Power trans.
L₂—S.w. antenna coil
L₃, L₄—Osc. coil

RCA MODELS Q22A, Q32

Part No.	Code and Description
30652	R ₁ —1 megohm, 1/4 w. res.
30685	R ₂ —33,000 ohm, 1/4 w. res.
30649	R ₃ —2.2 megohm, 1/4 w. res.
35595	R ₄ —15,000 ohm, 3 w. res.
30492	R ₅ —22,000 ohm, 1/4 w. res.
35620	R ₆ , S ₁ —Vol. control & power sw.
30436	R ₇ —12,000 ohm, 1/4 w. res.
35629	R ₈ —Tone control
30992	R ₉ —10 megohm, 1/4 w. res.
30648	R ₁₀ , R ₁₁ —470,000 ohm, 1/2 w. res.
14983	R ₁₂ —330,000 ohm, 1/4 w. res.
30180	R ₁₃ —120,000 ohm, 1/4 w. res.
30493	R ₁₄ —150,000 ohm, 1/2 w. res.
30735	R ₁₅ —560 ohm, 1 w. res.
34761	R ₁₆ —10 ohm, 1/4 w. res.
34654	C ₁ , C ₂ , C ₃ —Triple 2.5-10 μfd. mica trimmer
12714	C ₄ , C ₅ , C ₆ —2-12 μfd. air trimmer
70667	C ₇ —560 μfd. mica cond.
70687	C ₈ —3000 μfd. mica cond.
70582	C ₉ —47 μfd. ceramic cond.
70586	C ₁₀ —68 μfd. mica cond.
35619	C ₁₁ , C ₁₂ —Var. tuning cond.
35644	C ₁₃ —47 μfd. ceramic cond.
35645	C ₁₄ —68 μfd. ceramic cond.
39628	C ₁₅ , C ₁₆ , C ₁₇ —100 μfd. mica cond.
39636	C ₁₈ , C ₁₉ —220 μfd. mica cond.
39622	C ₂₀ —56 μfd. mica cond.
70615	C ₂₁ —05 μfd., 200 v. cond.
39632	C ₂₂ , C ₂₃ —36 μfd. mica cond.
70614	C ₂₄ —033 μfd., 200 v. cond.
70601	C ₂₅ —002 μfd., 200 v. cond.
70627	C ₂₆ —005 μfd., 600 v. cond.
70624	C ₂₇ —003 μfd., 600 v. cond.
70648	C ₂₈ , C ₂₉ —005 μfd., 1000 v. cond.
70631	C ₃₀ —01 μfd., 600 v. cond.
33014	C ₃₁ , C ₃₂ , C ₃₃ —10/10/10/20 μfd., 450/450/450/25 v. elec. cond.
45465	C ₃₄ —15 μfd. ceramic cond.

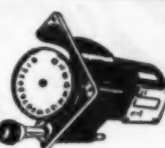
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DM 33 A. Input: 28 VDC @ 7 A. Output: 540 VDC @ 250 Ma. Power supply for modulator of SCR 274 N. \$3.95

Dyn. Model 23350. Input 27 VDC @ 1.75 A. Output: 285 VDC @ 75 Ma. \$1.75

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DM-25: In 12VDC 2.3A Out 250VDC 50 ma. \$2.49

DM-34: In 14VDC 2.8A Out 220VDC 80ma. \$2.49

DM-42: In 14VDC Out 515/1030 VDC 215/260-ma and 2/8VDC. \$3.95

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No. 5126: 5 V @ 3 A CT, 5 V @ 3 A CT, 5 V @ 6 A CT. \$3.25

No. 5100: 6.3 V CT @ 1.2 A, 5000 volt test. \$2.45

No. 5085: 6.3 V NCT @ .6 A, 6.3 V NCT @ 1.5 A. \$1.85

No. 5057: 6.3 VCT @ 1 A, 5 VCT @ 3 A, 5 VCT @ 3 A. \$2.75

No. UX 6899: 5 V @ 5.5 A, 5 V @ 5.5 A 29,000 V test. \$24.50

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Transformer to supply filaments of equipments using 12-volt tubes. Input: 117 V 60 cy. Output: 26 Volts @ 2A. \$1.50

CHOKES

6 Hy @ 150 Ma. \$2.00

6 Hy @ 300 Ma. \$4.50

1 Hy @ 800 Ma, 7.5 Ohms. \$8.95

Dual choke, 2-2 Hy. @ 100 ma. .50

Dual choke, 7 Hy @ 75 Ma, 11 Hy @ 60 Ma. \$1.95

8.5 Hy @ 125 Ma. \$1.95

25 Hy @ 65 ma. \$1.25

BC 1160 A RADAR TRANSMITTER

Range: 150-200 Mc. 115 VAC, 60 cy. Many Valuable parts: Blower, GR Variac, 10 tubes including 807 and 2X2, complete power supply. Size: 18x20x17 1/2". Weight 150 lbs. \$45.00

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Ideal for detecting under water sounds such as fish swimming in schools, within a 15 mile area. Using a Rochelle salt crystal, which is about 1000 times more sensitive than quartz. It is completely enclosed in a solid rubber sheath. This sound detector was originally used in harbor defense. Coupled to an audio amplifier, this can be found to have many valuable applications. It's the Model JR which contains 7 microphone units. \$12.50

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W. E. No. D-151756 Contains multivibrator, amplifier, rectifier; air and oil sections. Designed for 400 cycle operation. Has following tubes: 1-3E29, 1-6AG7, 1-8016, 1-705A. Size: 18"Lx10"Wx15"H. \$49.95

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All Standard Name Items GE No. K2731

Repetition Rate: 635 PPS, Pri. Imp: 50 Ohms, Sec. Imp: 450 Ohms, Pulse Width: 1 Micro-sec. Pri. Input: 9.5 KV PK. Sec. Output: 28 KV PK. Peak Output: 1800 KV. Biilar: 2.75 Amp. \$19.50

Type G.E. K2450A will receive 13KV, 4 micro-second pulse on pri., secondary delivers 14KV Peak power out 100KW GE. \$15.00

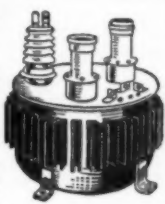
Hi Volt. Magnetron Input transformer W.E. No. D-166173 with cooling fins. \$12.00

UX 4298E Raytheon Pri. 4 KV, 1 microsecond sec. 16 KV, 16 amps. Fil. pri. 115v. 400 cycle. \$15.00

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Utah Pulse or Blocking Oscillator Transformer Freq. limits 700-810 cy-3 windings turns ratio 1:1 Dimensions 1 1/2"x1 1/2"x1 1/2". .75



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3J31 (1 cm) \$17.50

MAGNET for 3J31. \$8.00

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MAGNET for 2J32. \$16.00

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WE 700 A (L band) \$45.00

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MICROWAVE PLUMBING

10 CENTIMETER



Sand Load (Dummy Antenna) wave guide section with cooling fins, app. 23" high. \$28.00

Rigid Coax Directional Coupler CU-90/UP 20 DB drop has short right angle, about 8". \$5.50

Waveguide to flexible coax coupler (RG 18 U), with flange. Gold plated. App 10" high (as shown). \$17.50

Rigid coax slotted section CU-60/AP. \$5.00

Stub-supported rigid coax, gold plated, 5' lengths. Per 5.00

5' length. \$5.00

10 Cm. McNally cavity. Silver Plated. Type SG. \$3.00

Crystal Mixer, "S" Band. Complete with Type "N" fitting and IN22 crystal. \$3.85

10 Cm waveguide. 5/9" choke to cover. \$12.00

Per section. \$12.00

Per set of 4 sections. \$45.00

3 CENTIMETER

Wave Guide Sections 2.5' long, silver plated with choke flange. \$5.75

Wave Guide 90 deg. bend E Plane 18" long. \$4.00

Wave Guide 90 deg. bend E plane with 20DB directional coupler. \$4.75

Wave Guide 18" long "S" curve. \$2.00

Rotary wave guide in/out choke to choke joint. \$6.00

3Cm wavemeter Maqure 1539TFX. \$15.00

3Cm stabilizer cavity, tunable transmission type, Model 1551 (TFX 11 GA). \$20.00

3 Cm waveguide. 1 1/2"x1/2". 15 ft. lengths available. Per ft. \$1.50

Waveguide 2.5' long, silver plate, 180 deg. bend choke to cover. \$5.95

Duplexer Section using 1B24. \$10.00

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UG 21/U, Type "N" Male. \$.85

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COAX CABLE

RG9U51 ohm Silver Coated. per ft. \$.67 1/2

RG8U 52 ohm. per ft. .84 1/2

COAX Connectors, Amphenol Loss type \$31R, \$31AP. ea. .27

\$31F. ea. .45

MICROWAVE TEST EQUIPMENT

Wave guide experimental kit. Consists of: One direct-reading wavemeter, app. 2600-3400 mc. (cavity type); One dummy load w/crystal probe. One line stretcher, full wave; two wave guide to RG 18/U coax couplers; two 1/2 sections w/flanges. Complete. \$250.00

10 CM ECHO BOX, complete with micrometer adjust cavity and resonance indicator. Type TS 238/GP. With calibration chart. \$105.00

10 CM WAVEMETER. Model "8L". Micrometer adjust cavity with micro-ammeter resonance indicator. Includes 115 VAC operation converter section. In grey metal carrying case, complete with cables and spares. Made by Western Electric. \$135.00

W.E. 1138 A. Signal generator, 2700-2900 Mc. range. Lighthouse tube oscillator with attenuator and output meter, 115 VAC input, reg. power supply. With circuit diagram. \$80.00

PE 206-A. ROTARY INVERTER Input: 27.5 v. @ 38 amp. Output: 80 volts @ 500 volt-amperes, 800 cycles. New, complete with instruction book. \$12.50

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Relay System Parabolic reflectors approx. range: 2000 to 6000 Mc. Dimensions 4'-5" x 3' New. \$85.00

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3 CM ANTENNA WITH DISH 14 1/2". Cutter Feed horizontal and vertical scan with 28V DC drive motor and drive mechanism. Complete. New. \$ 65.00

AS 125/APR Cone antenna, stub-supported, with type "N" connector. 1000-3200 Mc. \$ 4.50



OIL CONDENSERS NATIONALLY KNOWN BRAND

.25 mf @ 20 KV. \$17.50

1.5 mf @ 6000 VDC. \$12.50

1 mf @ 25 KV. \$9.00

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.08 mf @ 1500 VDC. MX60. \$11.50

.03 mf @ 2000 VDC, 651A-50. \$12.75

.045 mf @ 2000 VDC, G1. \$12.75

.00015 mf @ 20KV, 1970-404. \$25.00

.0001 mf @ 20KV, G3. \$25.00

.0051 mf @ 15KV, G4. \$25.00

.006 mf @ 10 KV, G3. \$17.50

.002 mf @ 15 KV. \$20.00

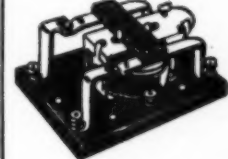
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SPDT, 115 VDC, 3900 ohms. Housed in grey metal can, size: 3 1/2"x2 1/4"x1 1/2". \$1.65. DPST (normally open) 12V DC, 70 ohms. In metal can. Size: 2 1/2"x1 1/4"x1 1/2". \$1.00. DPDT Antenna Relay, Leach 1077 BF, 22-28 V DC, 160 ohms. Ceramic Insulation. \$1.15

DPDT Antenna Relay: Leach 1067-490, 12 V DC, Has SPST receiver section, Ceramic Ins. \$ 1.20



SPECIALS

10 Cm. RF Package. Consists of: 80 Xmt-r-receiver using 2J27 magnetron oscillator, 250 KW peak input, 707-B receiver-mixer. \$150.00

Modulator-motor-alternator unit for above. \$75.00

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Rotating antenna using dipole feed and parabolic reflector. New Less Hood. \$75.00

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Magazine for KS 1200 9 recorder, made by W. E. Comes with wire for 1/2-hour recording. Has elapsed time indicator, recording and erase features. Size 14 1/2" Lx7" Wx5 1/4" H. Less Drive Motor. \$32.50

140-500 MC DIRECTIONAL ANTENNA 140-310 Mc cone and 300-600 Mc cone, each consisting of 2 end fed half wave conical sections with enclosed matching stub for reactance changes with changing frequency. New, complete with mast, guys, cables, carrying chest. \$49.50

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C₃₅—.05 μ fd., 600 v. cond.
C₃₆—6 μ fd. ceramic cond.
C₃₇—15 μ fd. ceramic cond.
L₁, L₂, L₃—19-13 & 23 m.
ant. coil
L₄, L₅, L₆, L₇, L₈—"A", "B"
& 31 m. ant. coil
L₉, L₁₀—"A" & "B" osc. coil
L₁₁—31 m. osc. coil
L₁₂—25 m. osc. coil
L₁₃—19-13 m. osc. coil
L₁₄—First i.f. trans.
L₁₅, L₁₆—Second i.f. trans.

WARDS MODELS 54BR-1501A, 1502A

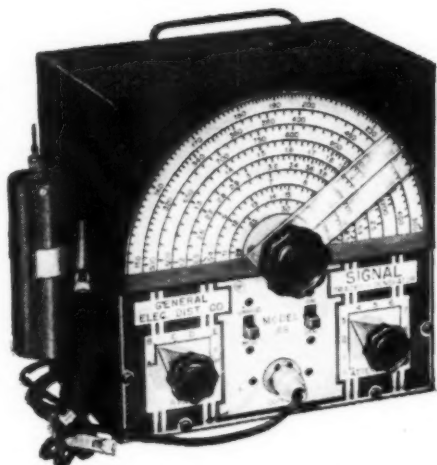
Part No.	Code and Description
BEA-9B1-78	R ₁ —22,000 ohm, 1/2 w. res.
BE101255	R ₂ , S ₁ —500,000 ohm vol. con- trol & sw.
BEA-9B1-34	R ₃ —3.3 megohm, 1/2 w. res.
BEA-9B1-35	R ₄ —4.7 megohm, 1/2 w. res.
BEA-9B1-26	R ₅ , R ₆ —150,000 ohm, 1/2 w. res.
BEA-9B1-27	R ₇ —220,000 ohm, 1/2 w. res.
BEA-9B1-52	R ₈ —150 ohm, 1/2 w. res.
BEA-9B2-63	R ₉ —1200 ohm, 1 w. res.
BEA-9B2-4	R ₁₀ —33 ohm, 1 w. res.
BEA-9B1-43	R ₁₁ —27 ohm, 1/2 w. res.
BE129114	C ₁ —Washer cond. mounted on ant. plate
BE124137	C ₂ —300 μ fd., 500 v. mica cond.
BE1009	C ₃ , C ₄ —Dual mounted ant. & osc. trimmers
BE12939	C ₅ —.05 μ fd., 200 v. cond.
	C ₆ —50 μ fd., 500 v. cond.
	C ₇ , C ₈ —Pri. & sec. trimmers (Part of T ₂)
	C ₉ , C ₁₀ —Pri. & sec. trimmers (Part of T ₃)
BE12912	C ₁₁ —250 μ fd., 500 v. mica cond.
BE10025	C ₁₂ —.002 μ fd., 600 v. cond.
BE1292	C ₁₃ —500 μ fd., 500 v. mica cond.
BE10011	C ₁₄ —.01 μ fd., 400 v. cond.
BE10026	C ₁₅ —.02 μ fd., 400 v. cond.
BE11992	C _{16a} , C _{16b} —20/40 μ fd., 150/ 150 v. elec. cond. (60 cycle models)
BE11993	C _{16a} , C _{16b} —40/60 μ fd., 150/ 150 v. elec. cond. (25 cycle models)
BE10091	C ₁₇ —.15 μ fd., 400 v. cond.
BE10013	C ₁₈ —.05 μ fd., 400 v. cond.
BE105138	L ₁ —R.f. choke coil
BE13614	T _{1a} , T _{1b} —Ant. & osc. coil as- sembly
BE108157H	T ₂ —Input i.f. trans. with trim- mers
BE108157I	T ₃ —Output i.f. trans. with trimmers
BE105128B	T ₄ —Output trans. for spkr.
BE18A-10251	T ₅ —4" PM speaker

TRUE-TONE MODEL D4620

Part No.	Code and Description
C-9B1-31	R ₁ —1 megohm, 1/2 w. res.
C-9B1-22	R ₂ —33,000 ohm, 1/2 w. res.
C-9B2-76	R ₃ —15,000 ohm, 1 w. res.
C-9B1-52	R ₄ —150 ohm, 1/2 w. res.
C-9B1-56	R ₅ —330 ohm, 1/2 w. res.
C-9B1-34	R ₆ —3.3 megohm, 1/2 w. res.
C-9B1-23	R ₇ —47,000 ohm, 1/2 w. res.
C-9B1-35	R ₈ —4.7 megohm, 1/2 w. res.
C-9B1-27	R ₉ —220,000 ohm, 1/2 w. res.
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124-187	C _{1a} , C _{1b} —Dual ant. & osc. trimmer
129-188	C ₂ —.00008 μ fd. mica cond.
129-2	C ₃ , C ₄ —.0005 μ fd. mica cond.
129-21	C ₅ —.0002 μ fd. mica cond.
100-9	C ₆ —.05 μ fd., 200 v. cond.
100-13	C ₇ —.03 μ fd., 400 v. cond.
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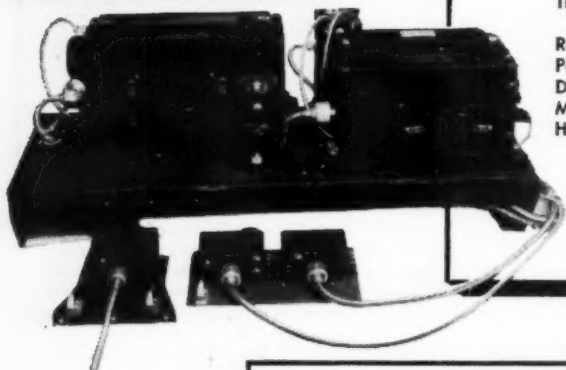
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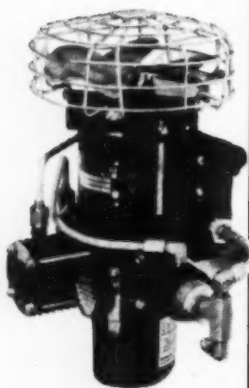
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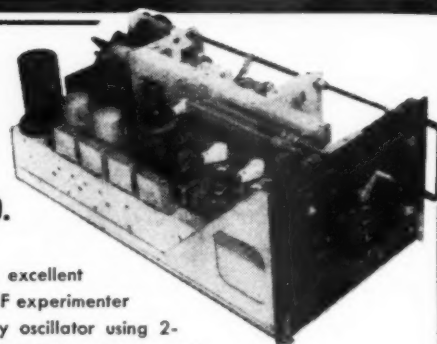
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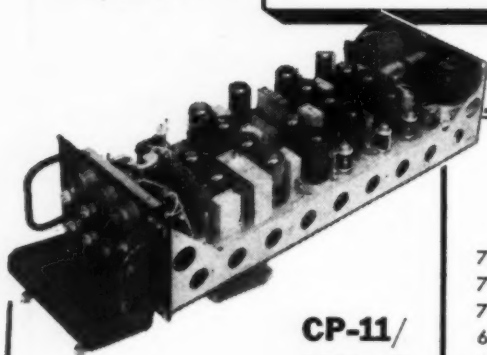
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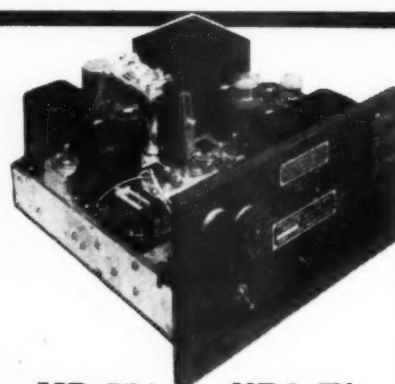
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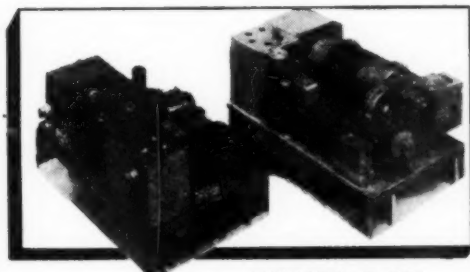
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Practical RADIO COURSE

By ALFRED A. GHIRARDI

Part 58. The i.f. amplifier requirements for different types of receivers; need for an interstage coupling device that provides tuning for adjacent-channel selectivity; and characteristics of single tuned i.f. transformer

THE intermediate-frequency amplifier is essentially a fixed-tuned r.f. amplifier designed to operate in class A at whatever fixed intermediate frequency the receiver is designed to employ. As it is the major gain and adjacent-channel selectivity element of every superheterodyne, it is important that it be designed to have the particular operating characteristics required in the type of receiver in which it is to be employed. Before proceeding with a study of its

design, it will be instructive to review, briefly, the requirements that the i.f. amplifier of a superheterodyne must fulfill.

I.F. Amplifier Requirements

The i.f. amplifier in an AM or FM sound superheterodyne, and the sound and video i.f. amplifiers in a television superheterodyne receiver, are depended upon to perform several highly important functions. The i.f. amplifier must provide:

(1) Sufficient amplification of the desired-signal voltage in order to provide a satisfactory amount of gain at the intermediate frequency.

(2) A suitable passband acceptance response characteristic (that depends upon the type of receiver) so that it will amplify and pass on both the i.f. carrier and all transmitted sideband frequency components of the desired signal that are considered important for its reproduction with acceptable fidelity.

(3) Sharp attenuation to below audibility of all carriers (and their sideband frequency components) in the adjacent upper, and lower, transmitting channels, so that any interfering adjacent-channel signals that may succeed in getting to the plate circuit of the frequency converter will be attenuated to below audibility.

(4) A satisfactory place in the receiver at which to make possible the application of *automatic volume control* (a.v.c.) if desired (usually in AM amplifiers only).

Satisfactory fulfillment of requirement (1) is often closely dependent upon requirement (2).

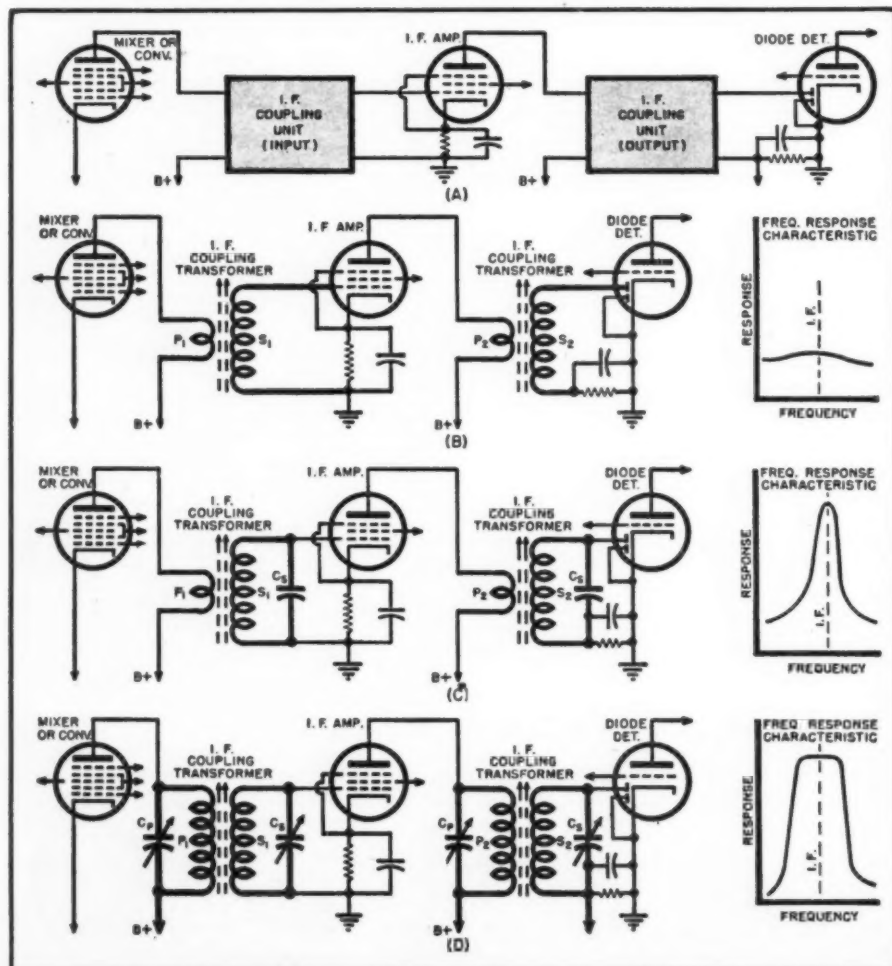
As the performance of every superheterodyne receiver depends to a large extent upon how well these requirements are fulfilled, the design of the i.f. amplifier is based upon them.

I.F. Amplifier Design Requirements Becoming Increasingly Complex

Until a few years ago i.f. amplifier design had narrowed down to a somewhat standardized pattern from which little variation was necessary in order to meet the foregoing requirements in receivers designed for the comparatively few different AM broadcasting and communications services then in operation. These early i.f. amplifiers employed screen-grid amplifier tubes, and later r.f. pentode amplifier tubes for increased stability and high gain per stage. One or two such i.f. amplifier stages usually provided sufficient gain for the requirements of the then-used types of receivers.

The band acceptance requirements of these receivers were comparatively simple—for AM broadcast receivers a total band-acceptance width of 9 or 10 kc. was sufficient to pass all important sideband components present in the received signal; for AM communications receivers a narrower passband, 3 kc. or less in width, was satisfactory. Consequently, the successive tubes


Fig. 1. Progressive development of interstage coupling units for an i.f. amplifier.



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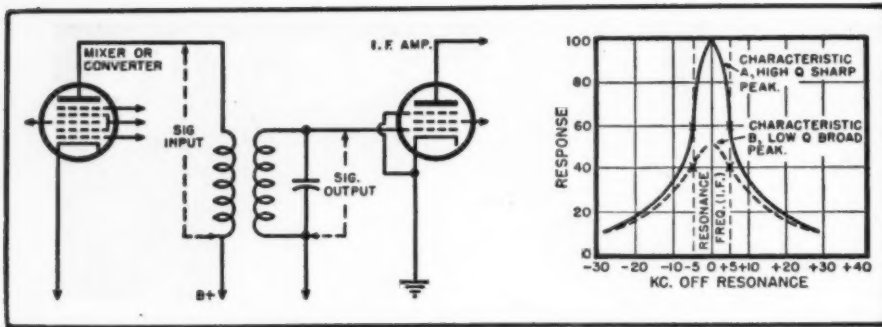


Fig. 2. Typical "peaked" frequency-response characteristics of a single-tuned interstage coupling transformer. Compare this response with that of Fig. 3.

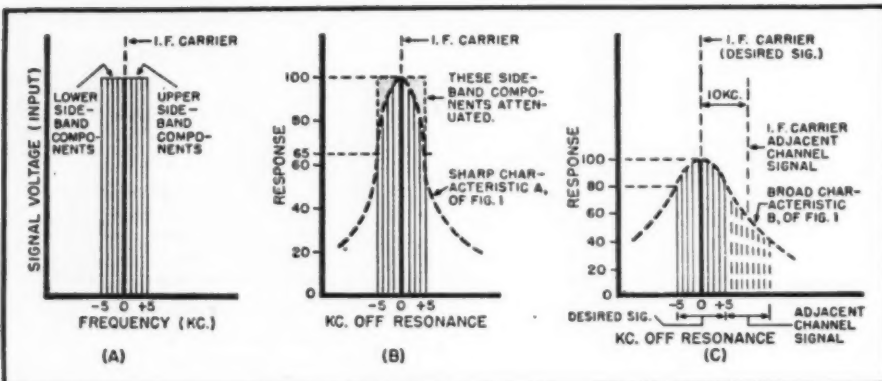


Fig. 3. Effects of sharply-peaked and broadly-peaked response characteristics on sideband attenuation and adjacent-channel selectivity of I.F. amplifier.

were usually coupled together by double-tuned, fixed-frequency transformers of comparatively simple design, the arrangement shown in Fig. 1D being most widely used.

As the r.f. signals to be received lay in the comparatively low-frequency portion of the radio spectrum these i.f. amplifiers could be designed to operate at comparatively low intermediate frequencies such as 110, 175, 262, or 370 kc. Thus, high gain per stage with good stability was rather easily attained.

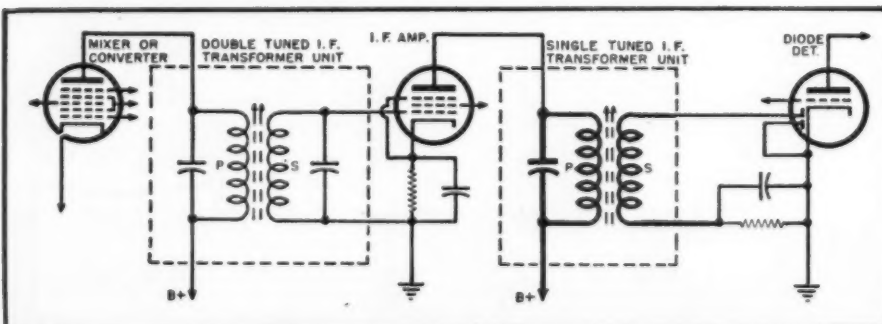
As new broadcasting and communications services have been developed and assigned mostly to the higher-frequency regions of the radio spectrum, the problems of designing superheterodyne receivers for satisfactory reception of their signals has become increasingly complex. For example, the trend toward signal transmission at the higher frequencies has made it

necessary to employ higher intermediate frequencies in the i.f. amplifiers. This has necessitated improved coupling transformer design and construction in order to obtain adequate gain per stage at these higher intermediate frequencies. Also, the widely differing passband acceptance requirements of the many different types of present-day receivers has further complicated the design problem. To illustrate, instead of it being necessary to design i.f. amplifiers to have only the few different passband acceptance widths required by such services as AM broadcasting, AM communications, etc., it is now necessary to design them to provide such widely differing total passband acceptance widths as:

- (1) 9 to 10 kc. for AM short-wave and standard broadcast receivers.

¹Alfred A. Ghirardi, *Practical Radio Course*, RADIO NEWS Part 54, July 1947; Part 55, October 1947; Part 56, November 1947; Part 57, December 1947.

Fig. 4. Use of single-tuned I.F. coupling transformer to feed diode detector tube in an auto radio receiver employing 175 kc. I.F. A tuned r.f. preselector stage has been utilized to provide for added adjacent-channel selectivity.



- (2) 3 kc. or less for AM communications receivers.

- (3) 150 kc. for FM high-fidelity broadcast receivers.

- (4) 4 mc. for video i.f. channels of television broadcast receivers.

- (5) About 80 kc. for sound i.f. channels of television broadcast receivers.

The necessity for constructing present-day "combination" type receivers of reasonable cost that make possible the reception of the signals of two or more of these different services at will, for example (1) and (2), (1) and (3), (3) and (4-5), etc., has added varied and rather severe performance requirements that have further complicated the problem, since the i.f. amplifier response characteristics required for each of these types of signal differs so widely. As a result of this challenge to receiver design ingenuity, almost every "design trick" known in the r.f. amplifier field has been utilized in building the i.f. amplifiers for some of these types of receivers (especially those of television receivers). A rather thorough basic knowledge of the theory of operation of coupled tuned-circuits, filters, and i.f. amplifier design is required before the construction and operation of such amplifiers can be understood. Consequently it will be well to first review the pertinent basic principles.

I.F. Amplification Required and Tubes Employed

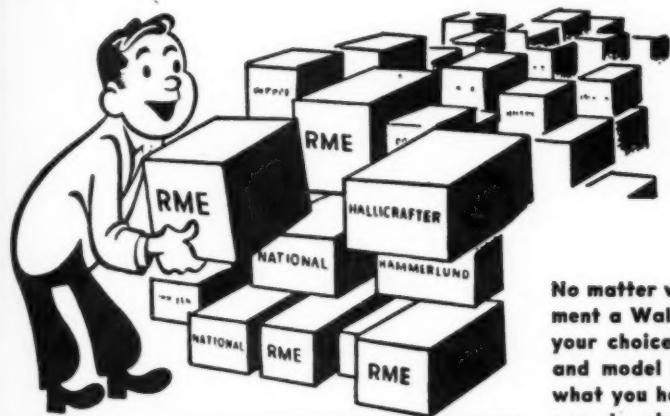
The amount of i.f. amplification required in conventional superheterodyne receivers designed for AM broadcast reception, AM communications work, FM broadcast reception, FM communications work, and television broadcast reception has already been discussed in the several preceding articles¹ of this series. High-gain r.f. pentodes of the type known under the various names "super-control," "remote cut-off," and "variable-mu" are of course the most logical i.f. amplifier tubes to use, as they have extremely low grid-to-plate capacitance for maximum circuit stability, high plate resistance for minimum loading of the tuned circuits, high mu and high transconductance for high gain. Such remote cut-off types are preferred to the sharp cut-off types to prevent cross-modulation from strong local signals when the volume control is set for low sensitivity, and to permit a wide range of a.v.c. action (in AM receivers) without detuning.

Passband Response Characteristics Required

The passband acceptance characteristic that is required in each of these types of receivers has also been discussed in detail in these previous articles. This ranges all the way from the narrow 3000-cycle (or less) total passband required in AM communications receivers to the 4-megacycle (4,000,000 cycle) passband characteristic of rather unusual shape required in the video i.f. amplifier of a television receiver.

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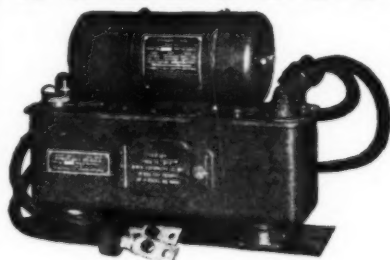
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the interstage coupling and tuning units of the intermediate-frequency amplifier must be constructed in order to make possible high i.f. stage gain, practical circuit stability in quantity-produced receivers, and at the same time provide the particular bandpass acceptance and interfering-signal rejection characteristic required—and this, for each of the several common types of receivers. Also, methods for obtaining two or more different bandpass acceptance characteristics (any one of which may be selected at will) in a single i.f. amplifier, when desired, will be investigated.

Need for an I.F. Interstage Coupling Device

Fig. 1A illustrates the basic elements of a simple single-stage i.f. amplifier such as is commonly employed in AM broadcast receivers. It contains a single high-gain pentode amplifier tube for high gain, a suitable interstage (input) coupling device for electrically coupling its signal-grid circuit to the plate circuit of the mixer or converter tube that precedes it, and another interstage (output) coupling device for suitably coupling its plate circuit to the input circuit of the detector tube that follows it. Transfer of signal energy from the plate circuit of each tube to the grid circuit of the next, without actually having direct electrical contact between them, could be easily accomplished by connecting between them a suitable trans-

former (untuned) having a primary winding, *P*, electrically insulated from, but magnetically coupled to, a secondary winding *S*, Fig. 1B.

Need for Tuning in I.F. Amplifier

This untuned transformer coupling arrangement would be satisfactory if it were not for the very important fact that the coupling device is required to not only transfer signal energy from the plate circuit of one tube to the input circuit of the following tube without direct electrical contact between them, but it must do so *selectively* by efficiently transferring only that signal energy which lies within a definite band of frequencies above and below the frequency of the intermediate carrier, and effectively attenuating to below audibility signal en-

²Frequently, i.f. interstage coupling transformers that appear to be untuned will be seen on the circuit diagrams of superheterodyne receivers—especially in the video i.f. amplifiers of television receivers. What appear, in such diagrams, to be untuned transformers are, in reality, double-tuned transformers whose windings are tuned to the high video i.f. by the stray plate and grid circuit capacitances (not shown on the diagrams) which exist in all amplifiers. These stray capacitances assume relatively great importance in video amplifiers because they are of sufficient magnitude to make it possible to employ them to tune the transformer windings to the rather high intermediate frequency (12.75 mc. or 25.75 mc.) employed in these amplifiers.

³Single-tuned i.f. transformers may be divided into two classes, according to which circuit is tuned—some have their *primaries* tuned, while others have their *secondaries* tuned. As far as the secondary voltage developed is concerned, there is not a great deal of difference, irrespective of which winding is tuned. However, if there is a likelihood of single-stage oscillation in the tube driving the single-tuned transformer, greater stability may usually be had by tuning the *secondary* rather than by tuning the *primary*.

ergy of all other frequencies. As an untuned coupling transformer is not sufficiently frequency-selective, it is seldom used² for this purpose. In those rare cases when one is employed to provide high gain at little cost, it is used in conjunction with one or more tuned i.f. coupling transformers in the i.f. amplifier—the latter supplying the required selectivity.

Since the i.f. amplifier must pass only those signals whose carriers are converted to the correct intermediate frequency value by the mixer or frequency converter, it is apparent that some sort of electrical resonance or tuning arrangement must be employed to tune it to the intermediate frequency that is to be employed in the receiver.

Single-Tuned I.F. Transformers

The simplest tuning arrangement would be one in which one of the windings of the coupling transformer, either the primary or the secondary³, was tuned by shunting it with a fixed (or adjustable) condenser, *C*, of proper capacitance to produce a resonance at the intermediate frequency which is to be employed in the receiver. This arrangement is illustrated in Fig. 1C.

Frequency-Response Characteristic of Single-Tuned I.F. Transformer

Examination of the typical frequency-response characteristic (curve A in

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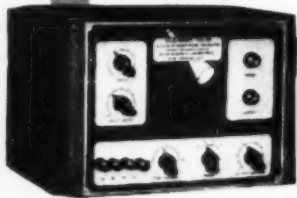
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2200 volts @ 2 Ma. 2.5 volts @ 2 Amp. 6.3 volts @ 1 Amp.....\$7.95

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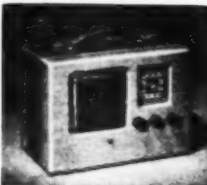
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Operating on either AC or DC or self-contained batteries . . . power switch conveniently located on front of set so that "battery" or "AC-DC" may be selected without opening case. Five-inch Alnico 5 permanent magnet dynamic speaker, and case covered with weather tested aircraft material. Price of Model 210 complete with tubes.....\$18.95

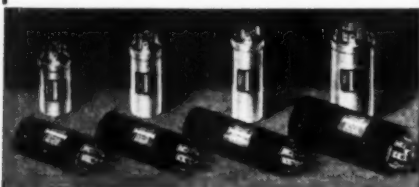
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Fig. 2) of such a single-tuned i.f. transformer reveals that it is sharply "peaked" at the resonance frequency (the i.f.), therefore it does not fulfill the bandpass requirements¹ of either sound or video i.f. amplifiers. Briefly, the signal voltage which appears across the tuned inductance (the tuned secondary winding of the transformer here), or the tuning capacitance, and which is applied to the input circuit of the tube that follows in the amplifier circuit is at a *maximum* at the resonance frequency, and *rapidly decreases* for signal frequencies higher or lower than this. This signal voltage at any particular frequency is a measure of the "response" of the circuit for that frequency. (If several similar single-tuned transformers are used in cascade as interstage coupling units of an i.f. amplifier, the resulting over-all response of the entire amplifier is sharper than that of each such unit.)

Sideband Attenuation Caused by "Sharp" Single-Tuned I.F. Transformer

Let us assume that the i.f. carrier, together with all the important upper and lower sideband frequency components (all assumed to be of equal amplitude and ranging in frequency to ± 5 kc. either side of the carrier frequency) of an AM broadcast signal of full tone as shown in Fig. 3A, is applied to a single-tuned coupling transformer tuned to this carrier frequency and having the sharply-peaked response characteristic illustrated by A of Fig. 2. Only the i.f. carrier and those sideband components close to it in frequency would get through without appreciable attenuation and be transferred at full strength to the input circuit of the following tube. All others, would be appreciably attenuated by the sharply-peaked response characteristic. The severely distorted signal shown in Fig. 3B would result.

An AM sound broadcast receiver that employed an i.f. amplifier having so sharply "peaked" a response characteristic would so distort the signal that very "boomy" and deep-toned unnatural reproduction of music, badly deficient in the life-giving high-frequency modulation components, would result (unless such severe attenuation of these components were exactly compensated for by the use of a following audio amplifier and reproducer system whose response characteristic was purposely designed to correspondingly over-emphasize these audio frequencies so as to attain a uniform over-all audio-frequency response for the i.f.-a.f. system as a whole). The effect of such severe sideband attenuation on the fidelity of the reproduced signal in an FM sound receiver or in a television receiver would be even more drastic and serious.

Adjacent-Channel Interference Caused by "Broad" Single-Tuned I.F. Transformer

At first thought it would seem that such severe attenuation of the side-

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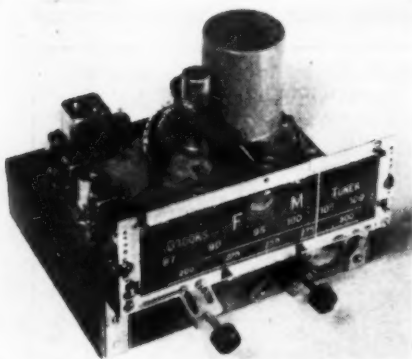
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band components could be reduced considerably by employing a single-tuned transformer having a response-characteristic that is much more broad at the peak. It is possible to broaden the peak in the response characteristic somewhat (but it will always continue to be a peaked type of response and never a flat-topped response) by designing the coupling unit so that the effective Q of the tuned circuit is lower. Unfortunately, when this is done for a single-tuned transformer, the maximum response (at the peak) decreases very materially but the response at frequencies appreciably removed from resonance is not altered very much. This is illustrated by broad-peaked response characteristic B in Fig. 2. Observe that the response at the resonance frequency is only about one-half that for sharp characteristic A , while for frequencies 10 kc. or more off resonance the response is almost identical for both characteristics.

The effect of such a broadened response on the signal illustrated in Fig. 3A is shown in Fig. 3C. Observe that the sideband attenuation is now less severe than in case of Fig. 3B, so the signal is not distorted so severely. However the amplitude of both the carrier and the sideband components is greatly reduced, which means that the stage gain is reduced. In addition, the adjacent-channel selectivity has been materially reduced. This will become evident if the adjacent-channel selectivity [for the i.f. amplifier in an AM broadcast receiver may be expressed as the ratio of the response at frequencies ± 5 kc. removed from resonance, to the response at the resonance frequency (intermediate frequency)] for the two operating conditions illustrated in Fig. 3B and 3C are investigated.

In Fig. 3B, assuming that the maximum peak response is 100 units, the response to sideband components of frequency ± 5 kc. from the resonance frequency is seen to be approximately 65. This is $100-65/100 = 35\%$ down from the response at the resonance. This response at ± 5 kc. from resonance is that which would be encountered by one of the high-frequency sideband components of an adjacent-channel signal whose carrier is 10 kc. removed from that of the desired signal. Consequently, it is a measure of the adjacent-channel selectivity of this single-tuned i.f. transformer.

In the case of the transformer having the more broadly peaked response characteristic, illustrated in Fig. 3C, the peak response at the resonance frequency, though much lower than for the sharply-peaked transformer, is also considered as 100 (smaller units). The response to an adjacent-channel signal's sideband components (drawn dotted at the right) of frequency 5 kc. from the resonance frequency is seen to be approximately 80. This is only $100-80/100 = 20\%$ down from the response at resonance. Therefore the higher-frequency sideband components

at least, of an adjacent-channel signal of equal strength, will get through at 80% of the strength of the desired signal. Naturally, severe adjacent-channel interference will result.

It is apparent that the single-tuned i.f. coupling transformer suffers from inherent characteristics that are undesirable. If the peak of the response characteristic is made broad enough to reduce attenuation of the signal sidebands to a sufficiently low level to be acceptable, the flanks of the response curve also become so broad that the off-channel selectivity is too low to prevent interference from strong adjacent-channel signals.

Applications of Single-Tuned I.F. Transformers

Because of the practical difficulties involved in designing single-tuned i.f. transformers that have a sufficiently broad response at the peak to prevent severe sideband attenuation and yet have adequate off-channel selectivity to prevent adjacent-channel interference, such transformers are not widely used in the i.f. amplifiers of AM broadcast receivers, and not at all in FM broadcast or television receivers. They have found their greatest application in the less expensive AM broadcast receivers, in which they are usually employed to feed the diode detector tube, as shown in Fig. 4 (a double-tuned i.f. transformer being used to couple the frequency conversion tube to the i.f. amplifier tube). When 175 kc. is used for the i.f. and a double-tuned i.f. transformer is used in combination with it, as shown in Fig. 4, use of the single-tuned type of interstage i.f. coupler does result in sufficient over-all adjacent-channel selectivity for those automobile or home receivers that employ a tuned radio-frequency preselector (3-gang tuning condenser used in the receiver), for in such receiver a well-designed t.r.f. stage aids the over-all adjacent-channel selectivity of the receiver.

The Double-Tuned I.F.

The foregoing discussion shows that single-tuned i.f. transformers have found only very limited use in i.f. amplifiers because they provide a peaked type of frequency response characteristic whose response decreases markedly if attempts are made to broaden it sufficiently to prevent severe cutting of the sideband frequency components of sound in video signals.

Two properly coupled, similarly tuned circuits, both tuned to the same frequency, forming, in effect, a double-tuned transformer can be made to provide the flat-topped, steep-sided type of frequency response curve that is desired. A one-stage i.f. amplifier employing two such double-tuned transformers is illustrated in Fig. 1D. The flat-topped (bandpass), steep sided, type of response curve that can be obtained by proper design is illustrated to the right. The operation of this type of interstage i. f. coupling unit will be explained in the next article.

(To be continued)

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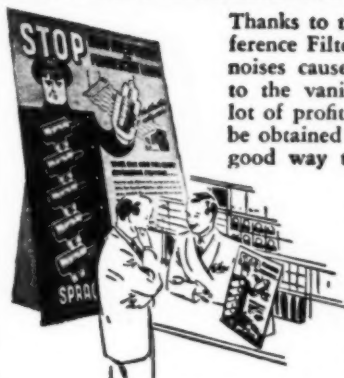
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FOR SALE—BC1267A, transmitter-receiver, \$35 and BC-1072A transmitter using P826 including power supply, \$40; both in new condition and fine for 2 meters; instructor graph code machine with built-in oscillator, \$15. HXQ75 with tube, \$8. Local buyer preferred, W3ICX, P. J. Hagan, 7411 Fayette St., Philadelphia, Pa.

URGENTLY NEEDED—Wiring diagrams and data for U. S. army PE-110-C power supply made by Hallcrafters. Will borrow or buy. Antone L. Oliveria, W1PWL, 94 Potomaca St., New Bedford, Mass.

FOR SALE—Hallcrafters 8-22R receiver, new PA system, tubes, mike, etc. Robert Paxton, 10110 Hereford Place, Silver Spring, Md.

WANTED—National NC-46, have Hallcrafters 8-41 to trade plus cash. Stephen J. Gurka, 26351 Zeman Ave., Euclid 23, Ohio.

FOR SALE—BC312 receiver, less tubes with instruction book, \$20. A. Larky, 223 W. Summit St., Somerville, N. J.

FOR SALE—National NC-101X receiver with matching 10" speaker, all handbands, xtal filter, terrific bandspread, 8 meter like new. Fred Singer, APJLHU, Silver Spring, Md.

SELL OR TRADE—Vomax 900. Want N.R.I. professional resistor-condenser tester or \$55 worth of popular tubes and Sprague resistors and condensers or cash. Reuben Lagman, Viola, Idaho.

FOR SALE—McMurdo-Silver 900 vomax in very good condition, \$55. E. Flowers, W2FWP, 439 Wooden Ave., S. Plainfield, N. J.

FOR SALE—Hallcrafters recliner, SX-42 and speaker to match, \$250. Ben F. Locke, Marthaville, La.

URGENTLY NEEDED—Final tank coil 14, to 18, mcs; antenna tuning unit 14, to 18, mcs for BC310E. S/Sgt. E. E. Bernfield, Special Services, RCAF, Rapid City, S. Dak.

FOR SALE—Kenyon T-656 plate transformer, T307 filament transformer and UTC 861 filament transformer; Stancor C1402 and C1403 Choke 250ma, UTA LS-50, 15,000/50; Cardwell Tuning Condensers, EU-75-AD Dual 75; ET-30-AD1, Dual 30, MT-100 dual 100 double space and misc. other parts. B. Hamilton, W3GLI, 432 W. Santa Barbara, Los Angeles, Calif.

SELL OR TRADE—Pierson PR15 communication receiver 550kc to 40 meg, \$85. Will accept BC221 frequency meter as part payment. A. G. Courchene, 60 Broadway St., Concord, N. H.

FOR SALE—RCA 155C 3" oscilloscope, like new, in original carton, \$80; Thor-darson 730W14, 14 watt amplifier in original carton, \$42; also 88-108 mc FM tuner using 10 tubes and various amateur equipment. John V. Urban, 140-34 Holly Ave., Flushing, N. Y.

WILL TRADE—3 line cushion, index, rubber stamp. Want one new or two used 12BA7, 12SK7, 12SQ7 or 50L6 tubes. T. Cookson, Puzico, Mo.

FOR SALE—Coils, 2 40 m, 1-10 m, 150 w., surplus 16.5 ceramic transformers, OPT assembly BC348P, 7500 V.A.C.C.T. 18 ma/115v a-c, 150 w., 500hy AF choke; 1244 1-1g, protective, 4 PST—220v a-c time delay, 100v d-c; some multiconductor cable. Ralph L. Gunther, W6THN, 1440 S. Curson Ave., Los Angeles 35, Calif.

SELL OR TRADE—TR-4 on 2m with ac power supply—20 watt bandswitch cw transmitter with PI ant. network; Westga 324 multimeter. Want 8mm projector, tube tester, VTVM, Audiooscillator, signal generator or what have you? Arthur R. J. Johnson, W2NFC, 217-38 35th Ave., Bayside, Long Island, N. Y.

FOR SALE—Abbott TR4 transmitter and receiver or 2 meters, never used, with tubes, single button control mike, \$40; also Hallcrafters 820-R sky champ just aligned, \$45. R. K. Ruggiero, W2RRV, 132 N. 13th St., Newark, N. J.

FOR SALE—Hallcrafters 840A communications receiver 3 months old, \$52 plus shipping charges. C. Nagy, 228 S. Main, South Bend, Ind.

WANTED—35mm camera. Will make good trade in radio tubes or parts for camera. M. Gershowe, 147 Chester St., Brooklyn 12, N. Y.

SELL OR TRADE—Erwood record changer and following tubes: 250, 450, 35T, 878, 3B24, 72, 3D23, TH35, 24, 240, 3428, 3424, 3424, 217A, 217C, 4C32, 257C, 4D23, 4-125A, 6B21, 304, etc. Write for prices. Want 16mm camera and projector and radio parts and receiver. Jim Simpson, Star Route, Alma, Calif.

FOR SALE—Shupson 315 signal generator, new, perfect, \$50. Albert M. Herring, 3422 Galloway, Memphis 12, Tenn.

FOR SALE—QST from March '32 to 1946 in good condition, \$25; also 12 White carpenter's chisel handles, Jones, \$8. L. J. Wood, Stafford, Genesee County, N. Y.

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RN-Jan. 1948

Selling Service

By G. E. VINSON

Alert, active salesmanship is the key to the successful operation of your radio business.

IT IS time that something was said about the independent radio serviceman and some attempt made to clarify some of the erroneous ideas that were making the headlines in radio circles during the war years. This is a candid, unbiased opinion of the situation as it stands today.

There were many articles written during the war concerning the status of the serviceman. Most of these voiced pessimistic misgivings which only caused conflict in the mind of the serviceman. If the individual radioman had taken this over-cautious advice seriously it might have been the cause of his undoing. At any rate, it caused financial setbacks if not a complete failure in several cases.

These articles advised the servicemen to become sales-minded, and warned that if they did not they were going to lose out. This is sound advice, but entirely too much emphasis was laid on the selling of appliances, however, and little was said about salesmanship in regard to repairing. For the small independent shop owner whose only business is to be the repairing of radios, salesmanship must be developed just as much as it must be for the successful selling of appliances. Perhaps you wonder why, if this salesmanship is developed for the purpose of selling service, it could not be put to good use in selling merchandise. The answer is, "It could be!" but here is the catch. The average serviceman lacks the necessary capital to start or maintain a going business in merchandise. An abundance of capital is necessary in order to weather the storms in this line.

I have seen small shops turn against selling new radios and appliances after the postwar buying spree dropped. Of course, this was an unusual period but the same difficulties that were then present are continuing. The main obstacle was lack of capital. Small shop owners had a considerable amount of cash tied up in their stock of merchandise, and could not profitably compete with the larger establishments.

When radios started moving too slowly, the department stores offered theirs at attractive discounts. If the small shop does this, it usually has to forfeit not part but all of its profit. The larger establishments can afford to take a loss of this nature in order to move their merchandise, but it usually does not consume the entire normal profit. Then too, the large

business has a much greater working capital which allows it to buy in huge quantities. This, of course, effects a neat deduction in cost which, in turn, allows a more flexible price range to sell profitably at discounts.

People like to buy in large, modern, air-conditioned showrooms where they can make their selections from a large and well-balanced stock. Of course, most of these stores are located in the downtown business sections where the rent is high. It takes a great deal of capital to construct a dream showroom. The serviceman is in an excellent position to market radios and appliances only if he has a large, modern store in a good location, and an abundance of capital. This might seem unfortunate to some, but it seems the serviceman should not lose sight of the aims which he had when he started his shop, that of radio service. His fortune lies in his ability to sell himself and radio service.

If an individual serviceman has the capital, then he should, by all means, try to expand; but he should not try to do so until he has the facts and figures on the contemplated expansion. To attempt it without advice, especially on the necessary expenditures, is simply courting failure. One should never make expenditures or buy with credit when it involves living beyond his means.

A good budget is a cure for over-expansion and a business should use one. The U. S. Department of Commerce is a reliable place to get information on business trends and data regarding any expansion plans you may have. Their advice is quite sound.

Since the average serviceman lives on the income derived from his shop and usually does not have the capital to venture into the selling of radios and appliances, he should explore the sales angles which can be used in selling more and more service. To do this he must acquaint himself with the principles of modern salesmanship and endeavor to develop these techniques. A discussion of salesmanship would take too much space, but there are many good books on the subject which the serviceman should seek out in his public library. I would like to mention, however, the importance of a good personality because it cannot be stressed too much. I think the average serviceman has a good personality, but some personalities could stand a little refurbishing. By all means, make the most of your

RADIO NEWS

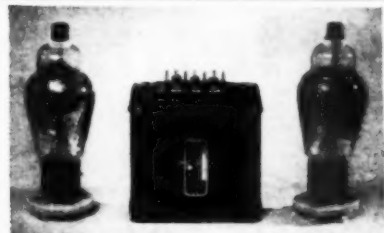
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864	.60	44	.04
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958	.29	NE220/51	.88
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Testing lines & equp Reads V&ohms 2
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SELENIUM ITAT 68BAV1/FW85V/2.4amp 6.95
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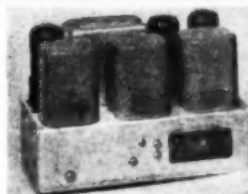
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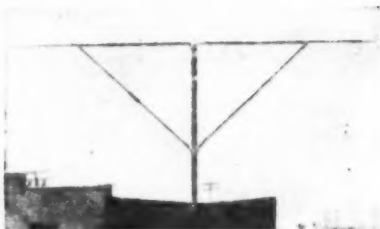
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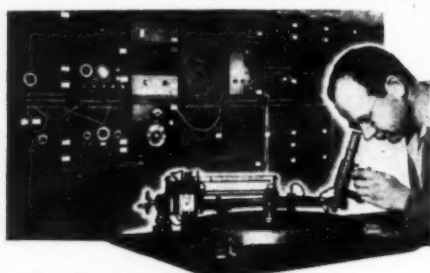
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8. Self-contained batteries—Last 1 1/2 years!
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COD orders okay—
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Write or mail orders today to:

LION PACIFIC CO. 4814 W. 98th St.

Inglewood, Calif., Dept. R-1

personality; it always pays dividends!

After the serviceman has learned good sales principles, he is ready to adapt these to the selling of his important services. Sales techniques are fairly easy to learn and no serviceman can afford to ignore them. However, do not overdo it to the exclusion of keeping abreast of important technical knowledge.

Proper advertising in plain everyday words that everyone understands is also important to the serviceman. The article, "What Does Your Customer Buy?," in the July issue, seems to me to be the ideal in good advertising. This was written on the theme of making your customer's radio "sing," a technique which is customer-wise.

The article, "At Your Service Madame," in the June issue, also seems to approach an ideal. Trying to please the housewife has always been a sore spot. You cannot overlook this important factor since it is she who will judge your ability as a radioman. She will not know if it sounds perfect, but she will scrutinize details as to cleanliness and neatness.

I firmly believe the average serviceman may enhance his position and increase his income by being sales conscious in regard to service, keeping abreast of important technical knowledge, making a determined effort to please, and by using good down-to-earth advertising. The extra effort will certainly be reflected in your cash register.

While the service business, for the most part, has declined over the past several months, time-tested sales techniques can help you over the rough spots. The measure of benefit gained is directly related to how faithfully you are able to carry them out.

Television should bring about the large volume of business of which we are so desirous, but you must be prepared to take advantage of this wonderful opportunity when it presents itself. While it is important to make radios "sing" now, it will be even more important to make the television pictures "beautiful."

-30-



RADIO NEWS



Brand New Automatic Direction Finder

RADIO COMPASS

SCR-269F Complete with Component Parts Less Power Supply **\$75.00**

This equipment comes complete with 17 - tube superheterodyne receiver which is tunable from 200-1750 KC in three bands. A complete instruction book for operation and maintenance accompanies this equipment.

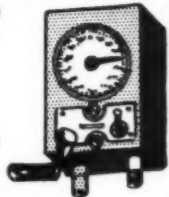
BC 433G RECEIVER

Complete with tubes. used. in good condition. **\$29.50**

Azimuth Control

\$49.00

Dial calibrated. 360° face. ideal for antenna rationalizing indicator.



T-17 CARBON MICROPHONE
\$89.00
Like new.

J-267 BC-654

Transmitter & Receiver

With tubes and xtals. used. in good condition. The frequency range of both transmitter and receiver is continuous from 3700 to 5800 KC; all stages gang tuned by anti-backlash worm gear dial mechanisms. **\$12.50**

PYRANOL CAPACITATOR



General Electric. 1 MFD. 5,000 VDC
\$2.95
4" x 4 1/2" x 3 3/4"

DYNAMOTOR DA-3A

Input. 28 V.D.C. 10.5 AMPS
Output. 300 V.D.C. 260 AMPS
150 V.D.C. 1010 AMPS
14.5 V.D.C. 5 AMPS
Shipping Wt. 25 Lbs.

Butterfly Condensers

Oscillator assembly 76 to 300 MC with acorn tube socket mounted on condenser. **\$1.95**
Type B. frequency range 300 to 1000 megacycles. **\$95.00**
antenna condenser 105-330 MC. **\$1.95**
Oscillator 105-330 MC. **\$1.95**

RADIO RECEIVER TRANSMITTER BC-620-A

\$9.95
20 MC - 27.9 MC

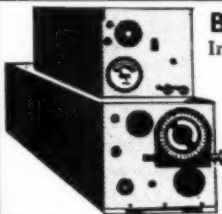
This Xtal controlled FM set has 13 tubes and has dual Xtal controlled channels. It also contains built-in Fil. and Plate Meter. Tubes used. (4) 1LN5, (1) 1LC6, (1) 1LH4, (2) 1291, (4) 1299, (1) 1294. Ideal for communication between Trucks. Boats. etc. Used. in good condition. Less power supply. Wt. 38 lbs. Complete with carrying case and diagrams.

TRANSMITTER TUNING UNIT BC-375

Approximately 65 MMFD cond., coils RF chokes, dials, assorted mica condensers, 2500 WVDC. Over \$50.00 parts! **\$1.95**

DYNAMOTOR UNIT PE-101-C

Duo output Dynamotor, input voltage 12 to 24V., output voltage 400V. at 135 ma. 800V at 20 ma. and 9 V. at 1.1 amp. **\$2.95**



BC-AR230 Transmitter

Including 4 tubes and Rf Amps. meter.

BC-AL229 Receiver

Including 6 tubes. Used in aircraft.

BOTH UNITS ONLY \$9.95

Overload Relay

\$1.95
J-236

Patter and Brumfield. Relay 1, 5,000 ohms, coil current 10 MA., Relay No. 2, 110V, 60 Cy. AC coil, S.P.D.T.

Variable Resistor

2500 ohm. **\$4.95**
100 W.

FILAMENT TRANS FORMERS

POWER TRANS.

\$1.95 110V. 60 cy. Sec. 1: 4V at 16 Amps. Sec. 2: 2 1/2 V at 1.75 Amps. Ideal for 2x2 and 826 tubes. Hermetically sealed. size 6" x 3 1/2" x 4 1/4"



IF TRANS. \$95.00

Mounted in aluminum shield can 1500 KC. with air trimmer. impedance coupled type.

Toggle Switch

\$1.49
J-213 39¢
D.P.D.T. 30 Amps. in black Bakelite case. **\$2.45**

30MC IF TRANSFORMER

Slugged Tune. **\$2.95**

Condensers

Cap. MFD	Working Volt	Your Cost
1	1000 oil	44¢
8	600 oil	95¢
2	600 oil	49¢

Squirrel Cage Blower

\$7.50
J-257
2" outlet. 110 AC. 60cy Silent Ball Bearing Motor, with mounting bracket.



Sockets for acorn tubes... **\$.19**
Powdered iron 3/8 slug... **.10**
Jacks, PL55, PL68... **.15**
Asst. mica condensers... **1.95**
3 lbs. asst. hardware... **1.00**
Pin straightener for min. tubes... **.49**
Ear phones, 2000 ohms, used... **.95**
Johnson sockets, No. 210, 25W... **.39**

CORONA BALLS High-Speed Photo Flash Tube

\$1.00 Dozen 10¢ Each

10,000 Flashes
12,000,000 lumens light output. Stops all action. Ignition coil included on back of bulb.

10,000 flashes. Diagrams furnished. **\$8.95**



TUBES

813	5.95	872A	1.95
VR150	.69	9004	.49
955	.65	9006	.59
9002	.89	50B5	.89
RK60	.95	VT127A	
9001	.89		2.95
6J4	1.50	35W4	.69
5FP7	1.95	3AP1	1.95
2BP7	2.95	3BP1	1.95
9LP7	3.95	6J5	.49
6N7	.89	5BP1	3.95
		6H6	.59
IT4	305	6SN7	.59
354	5W4		
6SA7	165		
12H6			
6SN7			

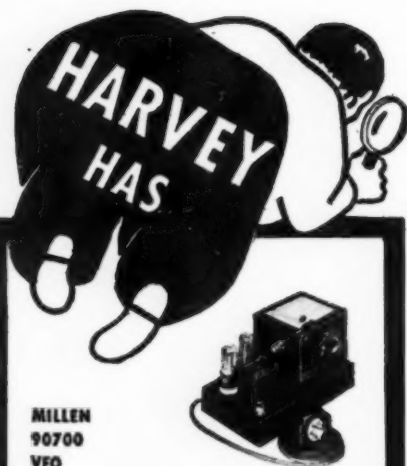
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5249 GRAND RIVER • DETROIT 8, MICH.

20% DEPOSIT REQUIRED ON ALL ORDERS

All Orders F.O.B. Detroit **Minimum Order \$2.00** Michigan Customers Add 3% Sales Tax



**MILLEN
90700
VFO**

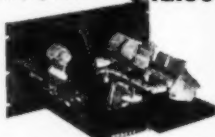
... a favorite frequency shifter, plug in place of your crystal for instant, finger-tip control of carrier frequency. Low drift. Chirpless keying. Accurately calibrated. Complete with tubes **\$42.50**



**MILLEN 90800
EXCITER-
TRANSMITTER**

... this popular 50-watt job is ideal for use as a low power transmitter or as an exciter for the high power rig. Uses 6L6 and 807. With coils for 10 meters, less tubes. **\$42.50**

**MILLEN 90881
RF POWER
AMPLIFIER**



... 500 Watts, for the end of your present rig, or as the basis of a new transmitter. Wired for a pair of 812's but can be used for other tubes. For all bands, 10 through 80. The 90800 above will drive this unit very nicely. Complete 90800 with one set of coils, less tubes. **\$89.50**



MILLEN 90810 HF TRANSMITTER

... Crystal control for 2-6-10-11 meters. Rated 75 watts output. Uses 6AG7, 2E26 and 829B. Can be driven by high frequency ECO. Normally supplied with coils for 10-11 meters, 2 or 6 meter coils available at \$3.60 per set. Transmitter complete, less tubes. **\$69.75**



MILLEN 90281 POWER SUPPLY

... rated at 700 V. DC at 250 mls and 6.3 V. AC at 4 amps. Completely filtered. Uses pair 816 rectifier tubes; has 2-section pi filter. Complete, less tubes. **\$84.50**

Telephone: **7-1rc** LO. 3-1800

**HARVEY
RADIO COMPANY INC.**

103 West 43rd St., New York 18, N. Y.

A SIMPLE REMOTE CONTROL CIRCUIT

By

JACK D. GALLAGER, WSHZB

THOSE who are confronted with remote-controlling their transmitter will find the following circuit very helpful. It provides a method of controlling the filament and plate switches of the transmitter plus the added protection of keeping the plate voltage off until the filaments are allowed to heat.

A simple time-delay circuit using a type 27 tube (chosen only because of the 2.5 volt filament winding on the power transformer available) is employed with C_1 and R_1 as the time-delay components. The time in seconds for C_1 to discharge through R_1 can be determined from the formula $T = R \times C$, where R is in ohms and C in farads, or R in megohms and C in μ fd. Each individual will probably desire a different time constant for the delay, therefore, the values of R_1 and C_1 have been purposely omitted.

When S_1 is turned on, a negative charging voltage is applied to C_1 . After the filament of the delay tube has heated, S_2 , the filament control switch, may be turned on. This action shorts R_6 , actuates RL_3 , and supplies plate voltage through RL_1 to the delay tube. Simultaneously, C_1 begins to discharge through R_1 and the plate current builds up closing RL_1 . S_3 , the plate control switch, can then be operated to apply plate voltage to the transmitter.

Turning off S_2 will remove the plate voltage at the transmitter as well as the filament voltage; thus, S_2 will turn the transmitter off or on, and provide adequate delay before the plate voltage is applied if S_3 has been accidentally

left on. Since the relays at the transmitter are controlled by voltage from the control unit, anything happening to the control unit, such as a shorted filter condenser, will automatically turn off the transmitter.

Tests and adjustments of the relays can be made with short leads for convenience. The sensitivity of the relays is an important factor, but those closing on 10 ma. will be perfectly suitable for this purpose. However, ruggedness and dependability are also important qualifications that should not be overlooked when choosing relays for any type of control unit. Such relays, suitable for use in this circuit, can be found at reasonable prices listed as war surplus items.

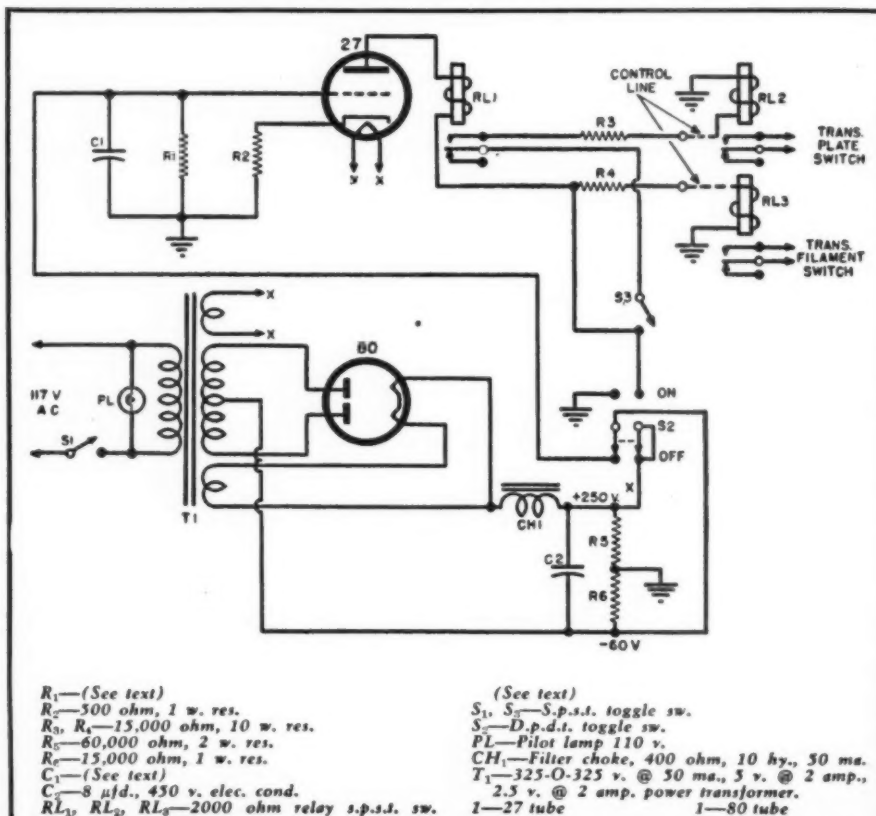
If it is desired, a 0-50 ma. meter, or larger, can be inserted at the point marked "X" for current indications when RL_2 and RL_3 are actuated, therefore providing a visual means of detecting the operation of the relays.

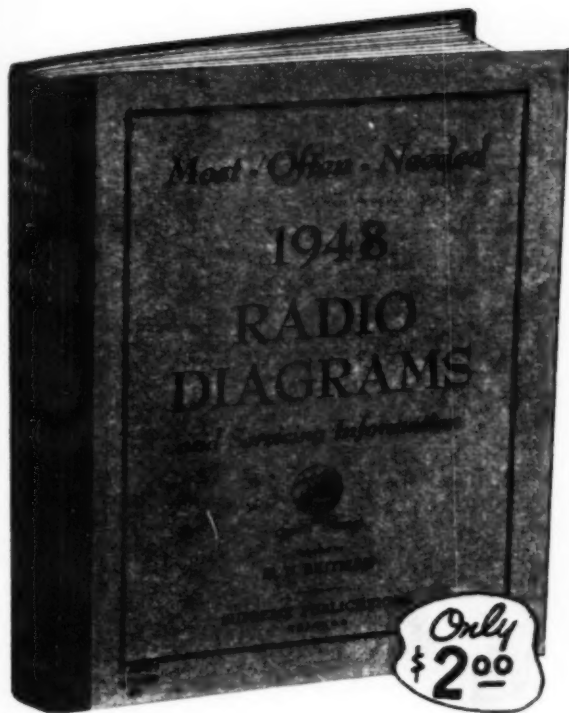
This unit can be constructed on any type of chassis, but with the careful selection of parts it can be made into a 6"x6"x6" metal box. The line terminals must be insulated, and the control lines must be kept free from contact with ground.

If the transmitter is to be placed in a locked garage, or in an attic or basement, it is advisable to use fuses in the transmitter wherever possible because of certain unusual situations which sometimes arise with remote control systems as well as transmitters.

-50-

Wiring diagram shows method for remote control operation of transmitter filament circuits and plate voltages, with special delay feature.





Supreme Publications New 1948 Diagram Manual

Here is your money-saving source for all popular, recently released diagrams of 1948 receivers. Learn about modern circuit developments, be ready to repair any new radio no matter how complex. Millions of 1948 radios will be sold—you will have to service them right now, through this year, and for many years to come. The total cost is only \$2.00 for this giant volume—nothing else to buy, nothing else to pay, covers a whole year of radio diagrams. Read about other volumes for previous years described below. "No-risk" examination granted to servicemen.



Amazing Bargain Offer in Diagram Manuals

NEW MANUAL OF ALL POPULAR 1948 SETS

Models Made by:

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Be prepared to repair quickly all new 1948 receivers. In this big single volume you have clearly-printed, large schematics, needed alignment data, replacement parts lists, voltage values, and information on stage gain, location of trimmers, and dial stringing, for almost all recently released sets. A worthy companion to the 7 previous volumes used by over 120,000 ahrewd radio servicemen. New manual covers models of 42 largest set manufacturers. Giant size: 8½x11 in., 192 pages + index. Manual style binding. Price postpaid, or at **\$2.00** your jobber, only.....

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Learn new speed-tricks of radio fault finding, case histories of common troubles, servicing short-cuts, extra profit ideas. Many large lessons on the use of regular test equipment, explanation of signal tracing, television, recording dope. Many active servicemen used this reduced price radio training for brush-up and study of new service methods. Recently printed with new information on signal-tracing, television, visual alignment, P.A., photocells, etc. Complete, 22 lessons, size 8½x11 inches, 224 pages. With self-testing questions and index. **\$2.50** Postpaid, only.....

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Compiled by
M. N. Beitman,
radio engineer,
teacher, author,
& serviceman.

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25 Watts—P.P. 6L6 to 4-8-15-250-500 ohms. SPECIAL...\$2.59 each
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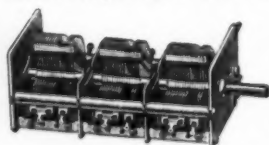
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Upright Mounting—Primary 115 Volts—60 Cycle, 700 Volts C.T. at 115ma.—5 Volts at 3 amps. and 6.3 Volts at 3.2 amps.

ONLY.....\$3.45 each

STEPDOWN TRANSFORMER

220/240 Volts to 110/120 Volts. Rated at 85 watts. Fully shielded. Has 6 ft. heavy cord for 220 volt line and flush receptacle for 110 volt line...\$2.95 each



Another
Sensational
Offer!

3-GANG VARIABLES

3-gang cut plate condensers used for dial tracking. Rugged construction. Maximum capacity for each section 365 mmfd; minimum capacity 10 mmfd. Each section has variable air padder with 140 mmfd. maximum capacity, 5 mmfd. minimum. 7 3/4 x 3 1/4 x 2 3/4" Shaft is 1 1/4".....\$1.19 each

4.3 Mc F.M. TRANS. KIT

THREE IF's AND DISCRIMINATOR



Excellent quality transformers specially designed with broad response for FM circuits. Metal shield can 1 3/4" sq., 3" high; windings on molded plastic form; ceramic-base mica-dielectric trimmers; double tuned. Discriminator transformer is accurately peaked at 4.3 mc. Mica-trim type in metal shield can, 1 3/4" x 3"; coils on plastic form. Color-coded leads...\$1.49 per kit.

BUILD YOUR OWN RECORD PLAYER!

PHONOGRAPH MOTOR & CRYSTAL PICK-UP

"Alliance" phono. motor with 9" flaked turntable.....\$3.25

"Astatic" crystal pick-up.....\$1.95

BOTH FOR.....\$4.95

POWER RHEOSTATS

Ohmite 25-watt—5000 ohm.....\$.49 each

I.R.C.—50-watt—8 ohm.....\$.29 each

2 MFD—600 V Round Oil Filled Condenser—TLA type. SPECIAL.....\$.39 each

10 for.....\$3.00

All merchandise listed is BRAND NEW and FULLY GUARANTEED. Audiview offers you expert service and immediate delivery. Our 1948 value-packed catalogue will soon be available. Write for it today.

AUDIVIEW
RADIO PARTS CO.
325 Canal St., New York 13, N. Y.

LETTERS

from our readers

AN OBJECTION

IN your October issue of RADIO NEWS, page 108, S. G. Gainey describes a 'Low Range Ohmmeter' having two ranges, reading from left to right, on the same scale.

"I wish to draw your attention to the fact that the device shown in the diagram and described is covered by my U. S. Patent No. 2,188,588."

Haig Antranikian
R.D. 3

Lakewood, New Jersey

Thanks for bringing this to our attention Mr. Antranikian.

* * *

WHY, THANK YOU, SIR!

WHILE in the service I read RADIO NEWS and found it helpful in my rate of radio tech. Entering college (physics and math) I carried on a small repair business to help with expenses and RADIO NEWS helped out again. Now I am out of school and employed with the Civil Service CAA as maintenance tech and your magazine is still in there helping.

"I have meant to write many times and tell you how much this magazine has helped in various fields—especially the *Radio-Electronic Engineering Edition* which I receive—and at long last I have—written that is.

"Keep up your good work, the fields covered are many and the articles good. I've been tempted to send in some stuff but it never seems good enough to compare with what you print. Perhaps some day I'll send it along.

"I like your method of printing articles about scopes and how to construct them—very good."

W. J. Allaback

X-76-30568-69

Windham, Ohio

* * *

Perhaps Reader Allaback is being too modest about his abilities. We are always looking for good articles on radio subjects which would be of interest to the radio serviceman, the amateur, and the experimenter.

* * *

THAT GERMAN SET

YOUR October issue gives on page 156 a description of a Saba Home Radio Receiver. Knowing by experience the difficulties of controlling "long distance" information, we would like to point out a few items where author Greif missed the point.

"When he states 'that the usual type of receivers manufactured on the Continent is of the two or three tube regenerative variety' he gives evidence of being poorly informed and not a good judge. How would it be possible to assure a reasonable selec-

tivity with existing densities of broadcasting stations and receivers?

"The truth is, in Europe as well as in America, the production is almost exclusively in the super field.

"Where the author states that 'this Saba receiver could be classed as above average' he is right as long as he compares it to receivers of American make. Compared to the other European receivers, i.e., to the prewar German receivers, the Saba is not above average.

"Please note that we are not interested in the Saba Works and that our sole aim is to supply you with true information.

"With fraternal greetings."

Editor

De Radio Revue

Antwerp, Belgium

Thanks for the comments on the Saba receiver. It is nice to hear from fellow editors.

* * *

THE October issue of RADIO NEWS has an article on page 156 regarding a 'new' German radio receiver. This receiver seems to be the same or very little different than the ones manufactured by Telefunken in 1942 and 1943.

"The station spacing in Europe is only nine kilocycles compared to ours of ten kilocycles. In addition all Europeans are wavelength rather than frequency conscious so that marking the dial in wavelengths would not be sufficient, therefore the stations are marked on the dial with the country's own stations being capitalized so as to be more noticeable. This is true of English, German, French, and Italian receivers.

"This model radio receiver was made for many, not all, of the voltages available on the Continent. The power transformer had the rectifier tube mounted on it with various means of adjusting the voltage.

"Tests of a number of receivers showed a sensitivity of about 30 to 50 microvolts and an audio response of about 100 to 3500-4000 cycles. Since the stations were closer geographically and were of higher power, 10 to 50 kw. or 100 to 1000 watt satellite transmitters (particularly in Germany) fed by wire, greater sensitivity was not necessary.

"The statement that the general run of home receivers were regenerative does not seem to be correct. The receivers were usually table model superhets with 5 or 6 tubes. Most of the receivers, except German, copy United States models in appearance with the exception of long-wave bands. Generally they were greatly inferior to

Continued Savings thru "48" ROCK BOTTOM PRICES! ON ALL TOP QUALITY ITEMS

25 Pounds of Radio Parts and Assemblies

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100 assorted carbon and W.W. resistors ... 1/2 W. to 10 W. Wide range of values. All standard items **\$1.95**

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Spaghetti tubing. Assorted sizes from 1/32" to 1/2". Thirty-five 3 ft. lengths **\$1.00**

TERMINAL STRIPS AND BOARDS

25 Assorted **\$1.00**

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100 assorted ceramic condensers. Wide range of values **\$1.95**

TUBES !!

Every tube we sell is guaranteed to be exactly the same as those for which you ordinarily pay 2 to 3 times as much. No "off" brands, seconds, or used tubes. Your money back if not satisfied.

1A5	6J5	6SH7	12H6	35W4
1H5	6J6	6SN7	12J5	80
5U4	6K6	6SQ7	12SG7	954
5Y3	6S8	6V6	12SH7	955
6AL5	6SA7	7E3	12SJ7	956
6C4	6SD7	7N7	12SN7	9001
6C5	6SG7	12A6	30	9003
6H6	6SK7	12CB	31	9006

CHOICE
50¢
EACH

1A7	6K7	7Y4	12SQ7
1G4	6SJ7	12AH7	14A7
1N5	6Y6	12AT6	14B6
1R5	7A6	12BA6	2526
1S5	7A7	12BE6	35L6
1T4	7C7	12SA7	35Z5
3Q5	7F7	12SF7	50B5
6J7	7Q7	12SK7	VR105
			VR150

CHOICE
60¢
EACH

Your Choice 75c Each

6AB7	6AG5	6SB7Y	7H7	1LH4
6AC7	6AK5	6SL7	25L6	1LN5

SPECIAL CUSTOMERS' BONUS:

Deduct 10% from all tube orders of \$20 or over.

Special Purchases!!

LIMITED SUPPLY ONLY
ALL ITEMS SUBJECT
TO PRIOR SALE
Order Now!

PE-104 VIBRATOR SUPPLY

For BC-654 receiver section. Operates from 6 or 12 V. battery. 84V and 1.4V output.

\$4.95



LOOP ANTENNA
5/4"x8" 29c
10 for \$2.60

LOW IMPEDANCE PHONES. Unusually sensitive. Less head-band. Used—perfect condition. 10 for \$4.00. **50c**



WIRE

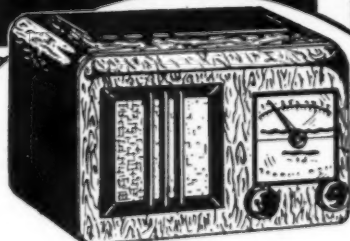
Impregnated cotton covered, loop antenna wire. Choice of 20, 22, 24, ga. 50c per 100 ft. \$4.15 per 1000 ft.

Heavy duty antenna cable. 12 ga. flexible copper stranded. Ideal for sturdy antenna construction.

\$1 per 50 ft.
\$1.85 per 100 ft.
\$15 per 1000 ft.

Hook up wire ... double cotton covered. Choice of stranded or solid ... 18, 20, 22 ga. 75c per 100 ft. \$5.50 per 1000 ft.

Coax. Cable RG8/U \$2.85 per 100 ft.



Superhet Kit!! 6 TUBES—Broadcast Band
For 110V AC or DC **\$10.95**
COMPLETE KIT

There's nothing tricky or weird about this set. Uses a standard superhet circuit with one tuned R.F. stage. Has 6 tubes, 2 R.F. stages, one I.F. stage, 12SA7, converter; 12SK7, I.F. Amp.; 12SQ7, detector and first audio; 35L6 output; 35Z5 rectifier, 12SK7, 1st I.F. Kit contains 6 1/2"x6 1/2"x10 1/2" walnut fm. plastic cabinet, punched chassis, 6 tubes, I.F.'s, loop antenna, 5" Alnico P.M. speaker, diagram, pictorials and all other necessary parts to build this dependable, simple to construct set. Complete Kit **\$10.95**

Was there ever a time that you would have paid any price for a hard-to-get piece of radio hardware? Then you can't afford to miss this:

DELUXE HARDWARE ASSORTMENT
Over 6,000 pieces of radio hardware ... including: screws, washers, lugs, clamps, rivets, ceramic insulators; grommets, spacers, bushings, nuts, eyelets, etc. Each piece will cost you about one-tenth of a cent!

Over 6000 Pieces
Shipping Weight About 5 lbs.

\$5.85

TERMS:

Money Order or Check
25% Deposit on all C.O.D. Orders.

IRVING JOSEPH

220 S. Halsted St.,

Chicago 6, Ill.

Chicago

INSTRUMENTS

Quality at Low Cost!



POCKET VOLT-OHM-MILLIAMMETERS FOR ONLY \$5.25

Anyone can now own a good volt-ohm-milliammeter. There is a Chicago V.O.M.A. priced at only \$5.25. Chicago "Featherweights" that slip easily into the pocket are the original miniature radio test instruments. They are popular throughout the world.

For years, Chicago Instruments have given radio men accurate, dependable service. And because of simplicity of design and freedom from "gadgets" we have been able to hold down prices to a fraction of what you would normally pay for instruments of similar quality.

Chicago Instruments are available in a variety of ranges and sensitivities. You may see them at your Suppliers or get the complete details by writing for Bulletin No. 10.

CHICAGO INDUSTRIAL INSTRUMENT CO., 536 W. ELM ST., CHICAGO 10, ILL.



IF YOU'RE interested in a steady year-in-year-out income—a substantial share of financial security for you and your family—you'll get in on the ground floor of this flourishing industry. You can build a lucrative business of your own NOW with TRADIO, the radio functionally-designed for coin operation in hotels, hospitals, tourist camps, motor courts, etc. Men and women like yourself all over the country are finding it a natural for big earnings and a steady income.

TRADIO ★ Tried ★ Tested ★ Proven

TRADIO has pioneered in this profitable postwar industry. Today, there are more TRADIOS installed throughout the country than any other coin radio.

Send for complete information and free illustrated brochure today. We'll put you in touch with the distributor in your territory if you'll phone Asbury Park 2-7447 or write Dept. P-1.



TRADIO, Inc. ASBURY PARK NEW JERSEY

THE SIMPLEST FM CONVERTER



Models 1002A 1005A

Converts 40-50Mc FM Tuners and receivers to 88-108Mc operation. Simple to attach and adjust. No power required. Hundreds now in use all over U.S.

Model 1002A List \$10.00

FM INTERFERENCE TRAP FOR TELESETS

Eliminates FM and amateur interference from tele image by absorption of interfering signal. Two adjustments provide for elimination of signals in 80-115Mc and 40-60Mc Ranges.

Model 1005A List \$10.00

CRYSTAL CONTROL FOR FM TV AND BC RECEIVERS

Send 25c (no stamps) for booklet describing applications of quartz crystal control for local oscillator of your home receivers.

See Your Local Parts Jobber or write for information

CRYSTAL DEVICES CO.

1819 Broadway, NEW YORK 23, N. Y.

our cheapest receivers in construction and the tubes would not compare in life with ours.

"In my opinion we are greatly advanced in radio over any other country and can remain so if we continue to progress as we have done in the past. If we stop progressing or consider that better radios are made in other countries we will not remain in the lead. Along with articles such as you published it would be well, perhaps, to include information as to sensitivity, audio response, and wiring diagrams. A comparison would be of advantage."

Robert J. Woolsey
Chicago, Illinois

ON PAGE 156 of the October issue of RADIO NEWS magazine is a short article concerning a German home radio receiver. I very much desire to make contact with the author of the article, Karl Greif, so as to determine if the receiver described is or will be available in this country.

"Incidentally, the receiver is not a new product in Germany as I had the pleasure of repairing and operating the identical model while serving in the Army Signal Corps as a radio repairman. Your article, while praising the receiver, does not do it half the justice it deserves. Performance was in every way exceptional and ease of operation and workmanship put it head and shoulders above comparable American receivers.

Walter C. Snyder
Grand Rapids, Michigan

There seems to be a slight difference of opinion between Mr. Snyder and Mr. Woolsey on the merits of the receiver. Are you sure you two fellows are talking about the same set?

CONDITIONS IN INDIA

WE ARE very sorry to write you today of having closed down our interest in Karachi owing to the recent division in India, which also resulted in inflicting heavy damages on us.

"You may have also heard that postal, railway, and all such public services, which used to be very efficient normally have been paralyzed thus we have not received any issues of RADIO NEWS for the months of September and October. It is therefore requested that you send duplicate copies of these issues to our new address.

"If not inconvenient and possible, we would like to request that you announce in a forthcoming issue of RADIO NEWS that we have moved to Bombay from Karachi. Our new address is now Imperial Cinema Building, Lamington Road, Bombay 4, India. We believe such an announcement would be helpful to the manufacturers and suppliers in your country. Our cable address is the same, 'Vomax, Bombay'."

Chopra Radio Electric Co.
Bombay, India

NEW YEAR SPECIALS

SETCHELL CARLSON RADIO RECEIVER BC-1206-C

Designed to receive A-M beam signals. 24-28 vdc. Tube complement: 14H7, RF, 14H7, 14J7, 1F amplifier, 14R7, detector and 1st audio; 28D7, output, 195 to 420 KC 4" high x 4" wide x 6 1/2" long. Weight 4 lbs. Priced At Only..... **198**



Complete set of tubes.....\$2.98

W2BNW

Plastic Call Letter Plaque
Dress up that rig with a beautiful transparent plastic plaque. Call letters can easily and quickly be inserted or changed; merely slide them in or out of the grooves. Stands are 8" in length, 3" in height. Your choice of either transparent red or blue plaque in any one set of call letters for only..... **2.98**



STANDARD KEY

Everybody needs a key—here is a well made unit at a fraction of what they are worth..... **49c**

TUBE KITS

Complete set of tubes for SCR-522 **\$17.95**
Complete set of tubes for BC-348 **\$7.95**
Complete set of tubes for BC-312 **\$7.95**
Specify Model Numbers

NEW, STANDARD BRAND TUBES

TYPE	PRICE	TYPE	PRICE	TYPE	PRICE
1A3	0.98	6SR7	0.89	705A	4.95
1A7GT	1.10	6SR7	0.89	713A	1.65
1B24	4.50	6SR7	0.89	715B	1.65
1G4	0.88	6U5	0.98	717A	0.75
1G6	0.88	6V6GT	0.99	723A/B	0.95
1H4G	0.98	6V6GT	0.99	800	2.25
1L4	1.10	6X4	0.98	801A	0.75
1R4/1294	1.29	6X5	0.89	802/RK28	1.49
1T4	1.10	7AE7	0.75	803	0.95
1M5	0.99	7C4	1.50	807	1.25
1N5GT	1.10	7C5	0.89	808	2.95
1N21B	0.35	7F7	1.25	809	1.50
1L5	1.95	7L7GT	1.39	811	1.95
1R5	1.10	10Y	1.50	812	3.25
1R5	1.10	12A6	0.89	812H	0.90
2A3	1.39	12AH7	1.10	813	0.95
2C22	0.98	12AT6	1.10	814	4.49
2C26A	0.75	12BA6	0.89	815	2.25
2C34	1.15	12BE6	0.89	826	1.75
2C40	2.60	12C6	0.89	828B	3.95
2C44	1.75	12J5	0.69	830B	5.25
2D21	0.75	12K5	1.25	832A	2.25
2E22	1.50	12SA7GT	0.99	833A	34.50
2E25	3.95	12SG7	0.89	836	1.15
2E30	2.35	12SH7	0.89	837	1.75
2J32	20.00	12SI7	0.79	838	0.75
2J33	20.00	12SK7	0.89	841	1.20
2J56	20.00	12SL7	1.10	845	3.75
2JB51	4.95	12SN7GT	0.79	860	3.00
2Z2	0.84	12SQ7GT	0.99	861	50.00
3A4	1.49	12SR7	0.79	866A	0.95
3B7	0.98	12X3	0.98	872A	2.25
3B22	4.95	14A7	1.10	874	1.95
3B24	1.95	14B7	1.10	884	0.75
3D6/1290	0.89	14H7	1.25	923	0.49
3E5	2.95	14J7	1.25	954	0.75
3Q4	1.10	14R7	1.10	955	0.75
3Q5GT	1.10	15E	1.50	956	0.75
3S4	1.10	23D4	0.49	957	0.75
4C35	7.95	23D6	0.98	958A	0.75
5R4GY	1.15	24G	1.35	959	0.75
5T4	1.25	25A6	0.75	991	0.50
5U4	0.98	25L6GT	0.75	1005	0.99
5V4G	0.98	25Z5	0.75	1006	0.39
5W4	0.98	25Z6	0.98	1613	0.95
5Y3	0.60	28D7	0.75	1614	1.75
5Y4G	0.59	30	0.75	1616	2.95
5Z3	0.89	32L7	1.50	1619	0.98
5Z4	0.89	34	0.98	1624	0.98
6AB7/1853	0.99	35L6GT	0.75	1625	0.98
6AC7	0.99	35Y4	1.10	1851	1.25
6AG5	0.99	35W4	0.69	2050	0.90
6AG7	0.99	35Z3	0.99	2051	0.90
6AK5	0.99	35Z5	0.99	2052	3.95
6AL5	0.99	36	1.10	7193	0.49
6AQ5	0.98	37	0.69	8005	3.25
6AT6	0.75	38	0.89	8011	4.95
6AU6	0.89	39/44	0.59	8012	4.95
6B4	1.29	41	0.69	8016	1.49
6BE6	0.89	44	0.84	8020	0.98
6B8	0.99	46	0.65	9001	1.15
6C4	0.64	47	0.90	9002	0.98
6C5	0.51	50B5	1.89	9003	0.98
6C6	0.75	50L6GT	0.75	9004	0.98
6C21	12.95	70L7	0.89	9005	0.98
6D6	0.75	71A	0.69	9006	0.69
6F4	1.35	75	0.69	HF100	0.95
6F5	0.51	75T	2.95	HY69	1.75
6F6	0.95	76	0.75	HY75	1.25
6F6G	0.90	77	0.75	HY618	1.25
6F7	1.25	78	0.75	OZ4	1.25
6F8	1.10	79	1.10	RK60	1.25
6G6	1.10	80	0.53	RK72	0.50
6H6	0.69	82	0.98	T20	1.95
6J4	1.60	83	0.98	T240	2.95
6J5	0.59	83V	0.98	V70D	0.90
6J6	0.89	84	0.75	VR78	0.75
6J7	0.89	89	0.89	VR90	0.75
6K6	0.69	100T5	3.00	VR105	0.75
6K7	0.79	117L7	1.89	VR150	0.75
6K8	1.25	117Z3	0.89	Z225	1.95
6L6	1.25	117Z6GT	1.10	902	2.95
6L6G	1.20	121A	2.65	903	3.00
6L7	0.98	205B	4.50	2AP1	2.25
6N7	1.25	211	1.25	3AP1	3.45
6Q5	0.98	215A	3.00	3BP1	2.95
6Q5G	0.98	217C	7.50	3BP1	3.95
6Q7	0.89	250R	3.95	3BP4	5.45
6R7	0.98	274B	1.50	3CP1	3.95
6SA7	0.80	304TH	0.85	5F7	4.50
6SC7	0.85	307A	6.25	5TP4	0.40
6SF8	0.79	321B	3.00	7BP7	7.95
6SG7	0.89	321B	3.00	7BP4	14.95
6SH7	0.65	394A	4.50	7EP4	18.95
6SL7GT	0.89	417A	18.95	8AP4	50.00
6SK7	0.79	446A	2.60	10BP4	39.60
6SL7	0.89	703A	7.50	12JP4	69.75

No Mail Order For Less Than \$5.00

METER SPECIAL

Here is a natural for reading ant. current, neutralizing your beam or wherever a good R.F. Thermocouple Meter is needed—full scale—.750 ma. Complete with thermocouple General Electric type DW-52—2" round. A steal at..... **2.98**

PLUG-IN VACUUM CAPACITOR



50 mmf. designed to work with voltages up to 5000 volts. Will handle 5 amps. Made by General Electric—don't change the final when switching bands, just plug in condenser—size 1 1/4 x 1 1/2..... **2.98**

POWER!! POWER!!

Niagara can supply a power supply kit which will completely power the ARC 5 Transmitter used as a VFO or any one of the ARC 5 receivers. All basic components included for delivering 300 v. @ 150 mills & 24 v. for the filaments—no rewiring of equipment necessary. This kit will also power the BC-348, BC-312, and the BC-1206. A good buy at..... **7.50**

Master Oscillator MI-19427-B

This unit was built for R.C.A. Add a final—becomes a complete transmitter with signal shifter, 2-20 mc—also FM—only a few cycles drift from cold start. Complete with regulated power supply and heavy duty deluxe rack. Illustrated flyer giving complete description, technical summary and specifications available upon request. COMPLETE (less tubes)..... **225.00**

MINIATURE TUBE PULLER

Niagara solves your miniature tube breakage problem with this new sensational invention. Tubes may now be easily extracted or placed into those hard-to-reach places, without the fear of breakage or burning of hands. This new invention incorporates a heat resistant rubber cap with aluminum body and handy thumb-operated plunger release. Be sure to get yours today. Money back guarantee. Only 88c

ANTENNA LEAD IN BOWLS



Made of genuine Pyrex—3" in diameter; brass rod 8 1/2" long—complete with hardware and waterproof rubber gaskets. Special—\$1.49



Spert RF Vacuum switch used as antenna switch in the ART 13—3200 v. peak 8 amps..... **1.95**

BAT HANDLE SWITCH

Mfgd. by Cutler-Hammer—10 amp. SPDT with neutral position—Perfect for rotary beam control—a positive steal at..... **29c**

Selsyn Motors Synchronous Type

Pair in Series for 110 v. AC.
Type I—5 1/4" long, 3" dia.—50 v. AC, 50 cy.—4 lbs. **\$9.95 pr.**
Type II—6 1/4" long, 4 1/4" dia.—115 v. AC, 50 cy. 11 oz. **\$12.95 pr.**
SYNCHRO-DIFFERENTIAL
Model #1945—C78249-CAL-11280 Bendix Aviation 115 v.—60 cy. 6" length to end of shaft x 1 1/4" diameter..... **\$9.95**

DO YOU OWN AN SCR-522?

We have a complete power supply containing all the necessary parts down to the line cord, pilot light switch & terminal blocks & delivers the following voltage—300 v. DC @ 250 mills, 150 v. gang regulated bias and sufficient 12 v. to operate the tubes of both receiver and transmitter at the same time. Complete at the amazingly low price of..... **14.95**

Model 200-EA, 5-ELEMENT 2 METER BEAM KIT. Folded di-pole driven element. All-aluminum construction. Feed with low impedance coaxial cable. Amateur net price..... **\$8.40**

MAKE YOUR SCR-522 RECEIVER operate on 144 to 148 Mc. with only ONE control—complete kit & instructions..... **\$3.00**

FLEXIBLE ANTENNA MAST BASE

For Mobile Antennas, will handle up to 50 pounds. This ends the vibration and breakage problems in mounting either receiver or transmitter antennas in moving vehicles—16" in length, 5/8" in diameter. Extra Special while they last..... **1.89**

BC-348 Owners CONVERTER FOR BROADCAST BAND

Convert that BC-348 without any alteration in your circuit. Our special converter takes power from receiver. Just tune your set to 450 kc. and forget it. All tuning is done on a converted panel covering 550 to 1600 kc.—double conversion means High Sensitivity. Excellent Fidelity and Higher Selectivity—complete basic kit with schematic and full instructions—less chassis dial and tuning knobs. Terrific Buy at..... **6.50**

Slip-Ring ROTATOR



Here is the answer to that rotary antenna joint problem for 360°. A compact unit with four slip rings & contacts, silver plated, of course. Can be used for a stacked array—10 & 20, 6 & 10, 2 & 6, etc. **\$1.89**

COIL FORM



Made of very high grade ceramic—grounded for easy winding, can be used for a multitude of purposes—size 2 1/2" long x 1 1/4" wide. 29c ea. or 2 for 50c

NIAGARA RADIO SUPPLY CORP.

20% Deposit on all orders unless rated. We prepay freight on \$100.00 orders in U.S.A.

160 Greenwich St. New York City 6, N. Y.

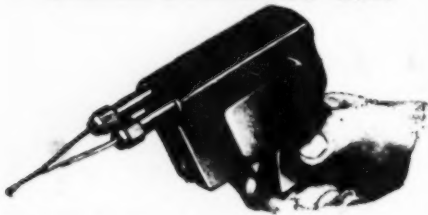
Write for latest Bulletin 12 RN All prices F.O.B. New York City.

Search the New V. H. F. Horizons at Minimum Cost!



Here is an outstanding chance for you to satisfy that hankering to play around in the 420-460 megacycle region without much strain on the bank roll. We have just received a limited stock of surplus armed forces Type RT-7/APN-1 FM Transceivers which we are selling at a "give away" price. These were originally designed for radio altimeter service and, as such, embody complete FM transmitting and receiving facilities in the 420-460 mc range. Furnished complete with 14 tubes: 3 12SJ7's, 4 12SH7's, 2 12H6's, 1 VR150, 2 955's and 2 9004's. Powered by a 27-volt dynamotor. Each constitutes a good nucleus for an efficient experimental V.H.F. rig. Assembled in 8 1/2" x 18 1/4" case. Weight approx. 25 lbs. Price as above.....**BRAND NEW.....\$11.95**

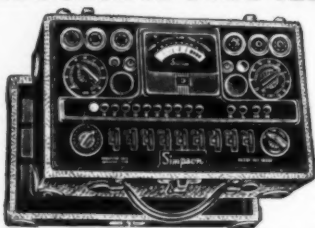
CUT SERVICE COSTS WITH A NEW WELLER SOLDERING GUN



Why dawdle around with a slow soldering iron when you can get five-second results with a Weller Soldering Gun? The built-in spotlight searches down in dark crannies and the greater reach of the loop point makes the hard jobs easy. Streamline design and pistol grip combine to make the Weller a real time and money saver for the busy service man.

No. S107 Single heat.....ea. \$12.95
No. D207 Dual heat.....ea. 14.95

SIMPSON Model 330 MUTUAL CONDUCTANCE TUBE TESTER



Tests tubes in terms of percentage of rated dynamic mutual conductance against the rated micromho values of the tubes. Indicates at a glance whether a tube is good, fair, doubtful or definitely bad. Reproduces more completely than ever before the actual operating conditions in a radio set. Ten push button switches and nine six-position rotary switches provide proper circuit set-ups for all tubes in general use including acorns.

Assembled in sturdy fabricoid covered plywood case. Heavy bakelite instrument panel. Removable cover and slip hinges. Size 15 1/2" x 9 1/2" x 6 1/4". Weight 9 lbs. Price complete \$98.50. For 220-volt 50 or 60 cycle add \$7.50. Terms: 20% cash with order — Balance C.O.D. If "not in stock" we'll refund by check — not credit slip.



**ELECTRONIC
MARKETERS, Inc.**

200 VARICK STREET, NEW YORK 14, N. Y.

Phone: WAtkins 4-9488

Within the Industry

(Continued from page 30)

for the Accessory Division, covering a large territory in the Middle West with headquarters in Chicago. He became manager of the Southwest Division of the *Philco* storage battery division in 1942 and two years later was appointed district representative for the Pittsburgh territory.

In his new position Mr. Utz will make his headquarters in Philadelphia.

* * *

J. ARDEN STILL is the new manager of the Southwestern Division of *Sylvania Electric Products Inc.'s* Distributor Tube Sales, succeeding Ray Carson, who recently resigned to establish his own business as a manufacturers' agent in San Antonio, Texas.



Active as an amateur operator for the past 33 years, Mr. Still's previous positions include two years with the *Davis Russ Company*, purchasing and managing for the radio department, and 13 years as manager of the radio department of *Strauss Frank Company*.

He will make his headquarters in Houston, Texas.

* * *

VARIETY ELECTRIC COMPANY, INC., of Newark, New Jersey, has announced the purchase of the complete stock of the Radio Parts Department from the *Bowers Battery and Spark Plug Company*.

The newly acquired stock has been placed under the direction of Stanley Dudek, manager of the Radio Parts Department for *Variety Electric Company*.

* * *

E. M. BRAUN has been appointed Jobber Sales Manager for *Maguire Industries* of Chicago. In his new post he will be in charge of all jobber sales for the *Meissner, Radiart*, and *Thordarson* Divisions of the company.



Prior to his new appointment, Mr. Braun was Sales Coordination Manager of the Electronic Distributor and Industrial Sales Department of *Maguire* for two years, and was with *Meissner Manufacturing Co.* for ten years in the Jobber Sales and Purchasing Departments.

* * *

NEWCOMB AUDIO PRODUCTS COMPANY, manufacturers of audio amplifiers and portable sound systems, have recently announced the appointment of Wally Swank of Syracuse, New York, to the post of factory representative for all of New York state excepting New York City.

Mr. Swank has been active in the representative field for six years before becoming sales manager for *E. F. Johnson Company* of Waseca, Minnesota. He recently left the *Johnson* organization to set up his own business in New York state.

* * *

A. D. ADAMS has assumed the post of advertising manager for *Air King Products Co., Inc.*, of Brooklyn, New York.



Formerly an account executive with *Hickey-Murphy-St. George, Inc.*, advertising agency, Mr. Adams served with the army in the Southwest Pacific for nearly five years. He has also been associated with several radio stations in Philadelphia and Trenton, New Jersey.

* * *

MORHAN EXPORTING COMPANY of New York has been appointed world exclusive export representative by *Pickering Company, Incorporated*.

The company manufactures the *Pickering* pickup, a professional studio pickup, equalizers, and cartridge reproducers.

* * *

ROBERT D. FERREE has recently been named Sales Manager of the *International Resistance Company's* Merchandise Division.



He succeeds Bob Baggs, who has left *IRC* to assume the duties of General Manager of a Philadelphia advertising agency.

Mr. Ferree has been associated with the company's jobber and industrial sales activities for seven years. Previous to that, he managed the parts department for a midwestern distributing firm. He is a ham enthusiast and holds the call letters W3JGB.

* * *

RICHARD (DICK) OSBORNE recently joined the staff of the *S. H. Cohn Sales Company*, Los Angeles manufacturers' representative for the *Universal Microphone Company*.

With sixteen years' experience in the radio parts field, Mr. Osborne is well qualified to handle the requirements of manufacturers and the industrial trades.

NORMAN E. WUNDERLICH, executive sales director of the radio division of *Federal Telephone & Radio Corp.*, has resigned from that post to establish a consulting radio engineering firm in Chicago.

He was associated with *Federal* for two years during which time he successfully introduced the company's new line of FM broadcast equipment, the 2-way radio telephone, and the company's selenium rectifier.

The new firm will operate a radio laboratory in conjunction with the consulting office to provide special

RADIO NEWS

Now

**NEW SERIES
16*
SUPER DELUXE
AM-FM
CHASSIS**

Here is the finest radio Midwest has ever produced in its 28 years of manufacturing—a world-ranging, 5-band radio with improved Midwest No-Drift FM . . . plus Standard Broadcast and 3 short wave bands, Television Audio Switch-over, and Color-Ray Tone Selection. The Series 16* Super De Luxe Chassis is a powerful, magnificently-toned radio that challenges comparison for performance, sensitivity, selectivity, and advanced engineering features. Supplied with satin stripe copper finish panel—ready to mount in your present cabinet. Send today for the FREE 1948 Midwest Radio Catalog. Buy your radio direct from the manufacturer on Easy Terms and 30 Days Trial and SAVE!

YOU CAN HAVE IMPROVED No-DRIFT FM in the Sensational New 1948 **MIDWEST RADIOS**



14½"
PANASONIC
SPEAKER

**5
WAVE
BANDS**

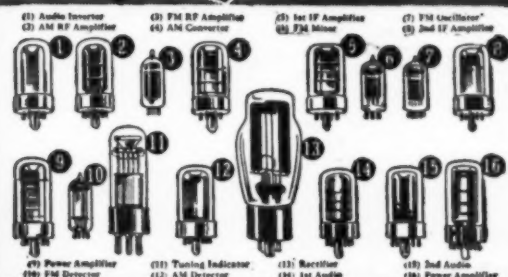
SERIES
16 CHASSIS USES ALL
THESE LATEST-TYPE TUBES

**30
DAYS
TRIAL**

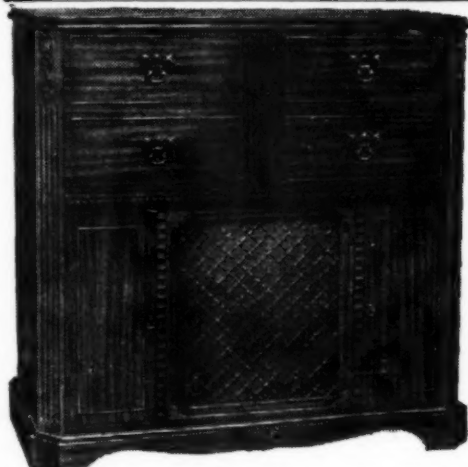
**LOW
FACTORY-
TO-YOU
PRICES**

**EASY
TERMS**

A COMPLETE LINE OF FINE RADIOS AND RADIO-PHONOGRAPHS . . . Available in Separate Chassis Like the Powerful Series 16* AM-FM Model above, or in beautiful Radio-Phonograph Consoles like this:



Scores of NEW Features such as the Exclusive **MIDWEST TRI-MAGNADYNE COIL SYSTEM** and **COLOR-RAY TONE SELECTION**



SYMPHONY GRAND AM-FM RADIO-PHONOGRAPH CONSOLE with NEW Intermix AUTOMATIC RECORD CHANGER

Our Finest! A superbly beautiful musical instrument . . . masterpiece of furniture design and radio engineering that offers the sensational Midwest NO-DRIFT FM, Automatic Intermix Record-Changer, Exclusive Color-Ray Tone Selection, World-ranging 5-Band Reception, Television Audio Switch-Over, and many more new and exclusive features.

Rush for Free Catalog!
FILL IN COUPON AND MAIL TODAY OR JUST
SEND YOUR NAME AND ADDRESS ON 1c POSTCARD

MIDWEST RADIO CORP.
Dept. 37-P, 909 Broadway
Cincinnati 2, Ohio

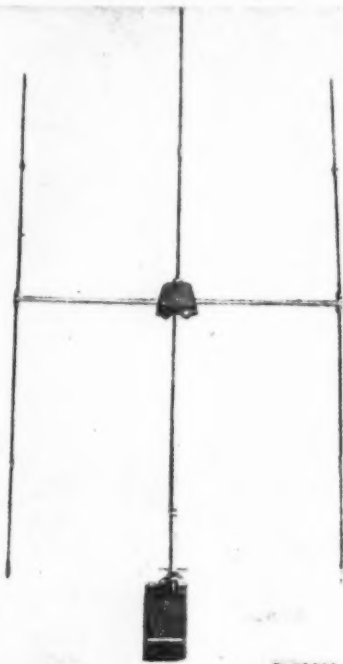
Gentlemen: Please send me your new FREE catalog and details of your liberal 30 Days Trial.

Name.....
Address.....
City..... Zone..... State.....

MIDWEST RADIO CORP.

Dept. 37-P • 909 BROADWAY • CINCINNATI 2, OHIO

RC-163 VERTICAL 3-ELEMENT ARRAY



TL90604

With Electrically Operated Rotator Continuously Tunable 20 to 39 Mc. (10-11 & 15 Meters)

Operates under all outdoor conditions. Assembly consists of 3-element array, rotating mechanism, field strength meter, Surveyor's Compass and Tripod, and all accessories and cables

- All Three Elements Driven • Feeds with 72-ohm line • Rotator strong enough to handle additional beams at same time • Continuously Rotatable • 4 to 5 db Forward Gain; Cardioid Pattern, completely null at back • Simplified Assembly, easy tuning, ready to go on air one-half hour after uncrating • Changeover from meters or back, in ten minutes.

Operates on 12V 4 1/2 Amps DC.
Your net cost, complete assembly.



10-11 to 15

\$89.50

HOTTEST ITEM OUT!

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service to both the broadcast and radio communications fields. Headquarters of the organization are at 1337 Fargo Avenue, Chicago, Illinois.

RADIO CORPORATION OF AMERICA'S Tube Department has recently announced two new appointments which will be of interest to the industry.

G. R. Rivers has been named manager of the Tube Sales Group with responsibility for coordinating all matters pertaining to the sale of tubes to the company's electronic equipment customers.

G. H. Myers has been named manager of the newly organized Customer Service Group. He will be responsible for interpreting customer requirements to the planning and production sections on tubes and component parts, and he will also be responsible for ex-

pediting customers' purchase orders.

Mr. Rivers has been with RCA for 17 years while Mr. Myers is rounding out a similar period of service for the company, and 31 years in the tube business.

AIR KING PRODUCTS CO., INC., manufacturer of radios, combinations, and wire recorders, has appointed two new organizations to handle the company's line.

Radio Electric Service of Pennsylvania, Inc., will handle Air King merchandise through its seven outlets in Philadelphia, Allentown, Camden, New Jersey, Wilmington, Del., and Easton, Pa.

Chamrose Distributors of Jamaica, Long Island, New York, will serve as distributors of the line for the Jamaica area.

AFTER-SPOT ELIMINATION FOR TELEVISION PICTURE TUBES

By LEO MACKTA, W2BJN

Under some conditions of operation of electromagnetic deflection picture tubes, an annoying and harmful after-spot may appear in the center of the screen when the receiver is turned off. This usually occurs when flyback or r.f. high voltage supplies are used, since no bleeders are placed across the filter condensers. This permits the high voltage to discharge slowly through the picture tube, whose cathode may stay sufficiently hot for several seconds to produce considerable emission. The after-spot may be small and the condenser charge large enough to produce a permanent defect in the phosphor after the receiver has been in use for several months.

To eliminate this difficulty several methods might be employed. A bleeder which will discharge the high voltage condenser rapidly enough will reduce the output voltage considerably. A shunting relay to discharge the high voltage condenser introduces insulation difficulties. Since the B+ voltage disappears before the high anode voltage, backing off the brightness control to maximum negative bias on the control grid of the picture tube, by a combined potentiometer-on-off switch will not solve the problem. The following simple procedure was finally adopted in constructing a receiver employing a 15" picture tube with flyback high voltage supply, in order to eliminate the after-spot. The additional parts required were a surplus six volt double-pole, double-throw relay, a paper condenser of from .25 to 1 μ fd., and a resistance of about .5 megohm.

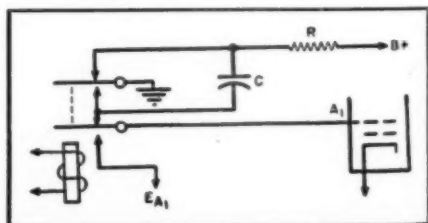
The relay coil was connected to operate in series with the focusing coil, in order to close when the receiver was turned on. Any other source of current in the receiver may be used to operate the relay. The total plate current might be used, since the voltage drop across the coil is less than six volts. If a high resistance relay coil is used it may be placed across a portion of the plate supply. An a.c. relay may be used across the heater supply or the 110 a.c. line.

The relay is used to apply a negative bias from a charged condenser to the

first accelerating anode of the picture tube. The bias voltage is equal to the plate voltage of the receiver, and it effectively stops any current through the tube after the receiver is turned off. The paper condenser will hold an effective charge longer than the smaller capacity employed in the flyback filter circuit, so that the after-spot will never appear unless the receiver is turned on again within several seconds after being turned off. The circuit diagram is shown in Fig. 1. The values of the components are as follows: C is from .25 to 1 μ fd., rated at plate voltage, R is .5 megohm, 1/2 watt. A₁ is the first accelerating anode of the picture tube and E_{A1} is the normal voltage ordinarily applied to A₁ in operation. Points X-X are connected in series with the focusing coil or as otherwise described previously.

As a result of the blocking bias thus applied, the high voltage condenser discharges quite slowly. Therefore, if repairs are to be made on the receiver after turning it off, deliberately discharge the high voltage condenser before proceeding further. Also remember that the capacity of the second anode in the picture tube is comparatively large and will retain a considerable charge. Therefore, discharge both the filter condenser and picture tube simultaneously, rather than attempting to remove the cap from the picture tube anode first. It is conceivable that a charge remaining on the second anode may startle one sufficiently to cause the picture tube to be dropped while it is being taken out of the receiver and the anode contact is touched.

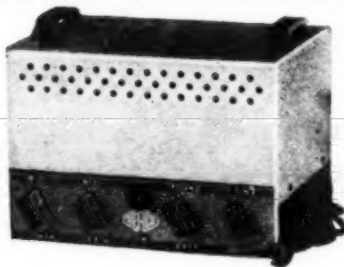
Fig. 1. Schematic diagram.



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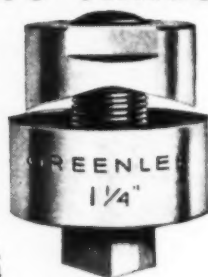


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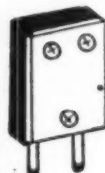
	Each	10	100
01..... 600V	\$0.06	\$0.55	\$ 4.60
02..... 600V	.06	.55	4.75
05..... 600V	.06	.55	4.95
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Electronic Switching

(Continued from page 51)

with the diode-branch of the line and have no effect during the reception of signals. The transmitter, itself, may be located at any distance from the junction point, making this circuit (Fig. 4B) considerably more flexible than the previous circuit.

Design Factors

Circuit design for electronic switching will differ for each installation, according to the arrangement and characteristics of the rig and according to the type of switching tube to be used.

Of primary concern is the *maximum r.f. voltage* output of the ham transmitter. A fairly accurate indication can be obtained from the equation:

$$E_{max} = \sqrt{PZ}$$

where P is r.f. output (in watts) and Z is transmission-line impedance (in ohms)

For example, a rig of 100 watts feeding a typical 300-ohm twin-ribbon line would have a *maximum r.f. voltage* of about 175 volts in the output circuit.

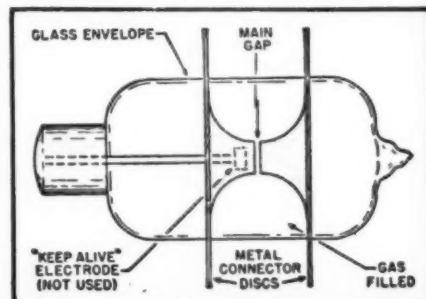
Since a gas-filled diode must arc at all times when the transmitter is operating, the rated *striking voltage* of a proposed switching tube must be less than the computed value of *maximum r.f. voltage* in the output circuit.

For low values of transmitter output power, ordinary neon or argon glow lamps can be used for electronic switching. However, these cold-cathode lamps are not too dependable, and after limited use they become erratic in striking and thus permit damage to the receiver input.

When a higher conduction rating is required, the type 866 (or 866JR) mercury vapor rectifier can be used as a switching diode. With the filament leads shorted and the filament operated cold, the striking voltage is very low (about 10 volts) and the tube conducts current up to about 1 amp. with safety.

The most desirable diodes for electronic switching, however, are the war-developed T/R tubes—of which more than 50 different types exist. Most of these are actively in use in Army and Navy apparatus, and cannot be obtained for civilian uses. But well

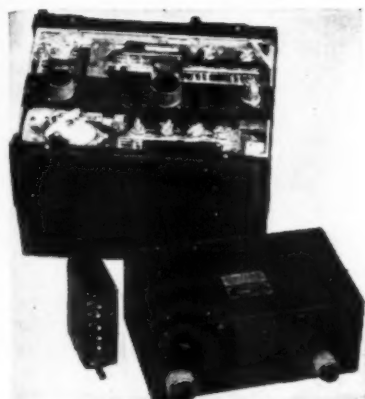
Fig. 6. Cross-section of a typical T/R switching tube, the Type 721B.



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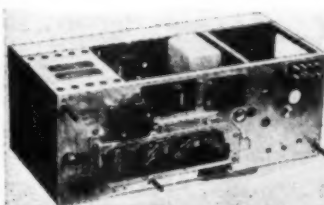
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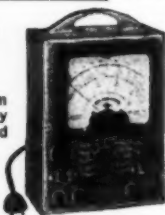
7B-11 Tube Super Het for AM-FM..... \$140.00 list
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A Combination Volt - Ohm Milliammeter plus Capacity Reactance Inductance and Decibel Measurements.

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over a dozen types have recently been declared as war surplus [Table 1], and these are now generally available from parts suppliers and dealers in surplus gear. Also included are several types scheduled to be declared surplus within the next few months.

Most of these T/R tubes were originally designed for operation with external resonant cavities at wavelengths of only a few centimeters. However, when used without such tuning cavities, the T/R tubes are entirely adequate for electronic switching at ham frequencies. In other words, the tube is used with no modification, just as it is received in its carton (Figs. 1, 2 and 3).

At operating frequencies lower than those for which the tubes were originally designed, however, action of the tubes in ham circuits (particularly at high power) may depart radically from theory. As with any new application, there is a need for quantitative results collected by ham experimenters over a considerable period of time.

The T/R Tube

A typical T/R tube is shown in cross-section (Fig. 6). Essentially it consists of two electrodes enclosed with a suitable gas vapor in a sealed glass or metal container. In most of the currently available types, the two metal electrodes are fixed. In two instances, however, the gap distance can be varied by adjusting the position of one electrode by a thumb-screw (external) arrangement; such tubes (Types 1B24 and 1B27) are extremely desirable for ham experimenters, since the striking voltage can be varied over a wide range by changing the width of the spark gap.

Some of the currently available types (Figs. 1 and 2) are equipped with circular discs or "fins" surrounding the envelope. These are radial extensions of the two principal electrodes, and provide a means of mounting the tube directly to the transmission line—usually by means of clips.

Gap operation in gas vapor and at greatly reduced pressure permits a lower value of striking voltage than would otherwise be possible. Also, some types of T/R tubes have a third electrode (Figs. 1, 2, 3, and 6) which is used in radar technique to maintain a "keep alive" voltage (d.c. and negative) in close proximity to one of the gap electrodes. This "keep alive" voltage assists the gap in striking more rapidly, but for all ham switching purposes this third electrode can be ignored. The T/R tube will function adequately without it; in fact, life of the tube will be considerably increased. If desired, the external (male) stub connector for the "keep alive" voltage can be used to mount the tube more securely.

The ordinary life of a T/R gas-filled switching tube is determined by two factors, both of which are gradual over long periods of operation. The most common cause of failure is due to metal particles knocked loose from the gap electrodes and spattered on the inside of the glass envelope, which act as small conducting areas—first appearing cloudy, then opaque and metallic. A second cause of failure is due to the absorption of gas by the metal electrodes, reducing the pressure in the tube and increasing the value of the striking potential. This increase in sluggishness is gradual, however, and can be detected during routine checks on equipment.

Table 1. Operating characteristics of the more readily available T/R tubes.

TYPE No. of T/R TUBE (currently available, war surplus)	STRIKING VOLTAGE	Recommended for use in transmitter circuits of			Approx. LIFE in hours (continuous)
		LOW Power	MED. Power	HIGH Power	
721A, 721B	200-400		x	x	300
724A, 724B	90-150	x	x		200
702B	300-500		x		300
1B21, 1B21A	Over 500			x	200-300*
1B23, 729A	Over 400		x	x	300-400*
1B25, 1B25A	90-100	x	x		400
1B32/532A	250-1000		x	x	600
1B43 Sub-miniature	100-250	x			200-400*
2J-B51 [Sylvania]	200-400		x	x	300
Special types, with variable gap widths:					
1B24	Variable	x	x	x	200-800*
1B27	Variable	x	x		200-800*

Note: The following types of gas-filled tubes are not recommended for amateur use, because of excessive power requirements, short life, or other factors. The types: 702A, 709A, S829, 1960, 1961; and the new series types: 1B22, 1B26, 1B28, 1B29, 1B35, 1B36, 1B37, 1B50, 1B51, 1B52, 1B53, and 1B54.

*Depending upon amount of power used.

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2AP1	\$ 1.95 ea.
2C22	\$.79 ea.
2J22	\$15.95 ea.
2J32	\$15.95 ea.
2J38	\$15.95 ea.
2J48	\$15.95 ea.
3CP1	\$ 1.95 ea.
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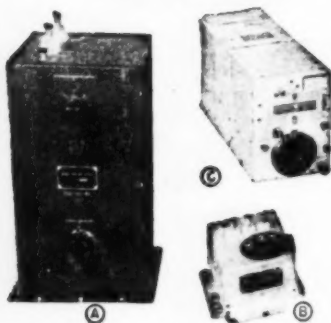
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Abrupt failure of a T/R tube is always possible. One means of protecting the receiver from such an event, is to install two T/R tubes in parallel at each switching point (Fig. 4) wherever one tube is indicated. Another method is to insert extremely small fuses in each side of the receiver feed between the T/R tube and the input of the receiver; this is no guarantee that some power won't get through, but extremely violent transmitter surges will save the receiver from serious damage.

A test of the effectiveness of any T/R switching tube is to replace it with a shorting bar. Under normal circumstances, no difference in transmitter operation should be apparent.

Tube Types

The selection of suitable T/R tubes will depend on the particular rig. Some experimentation will be necessary to obtain the best operating positions for the diodes, because use of T/R tubes at low radio frequencies is a relatively new and unexplored field. Since power distribution in output transmission circuits is often wholly different from that supposed by many operators, it's advisable to conduct experiments with caution and to take all measures necessary to prevent possible damage to the receiver. —30—

SET PRODUCTION

RADIO Manufacturers Association has just released figures on third quarter receiver production.

A total of 3,761,271 radio and television receivers were produced by RMA member-companies during that period, raising the total number of sets of all types produced from January through September of 1947 to 12,371,915.

A total of 55,009 television receivers was reported by RMA companies in the third quarter and 32,719 in September, 16,991 of which were manufactured previously but unreported. Third quarter television set production represents a gain of almost 10,000 over the combined first and second quarter output for 1947 and was more than eight times as great as the entire television production for 1946.

Member-companies produced 233,209 FM-AM sets in the third quarter to bring the year's total, through September, to 678,772 units of this type.

—30—

Robert L. Wells, of Citizens Radio Company, Leesburg, Florida, recently encountered this unusual phenomenon. A shorted input filter condenser caused the glass envelope of a Tung-Sol type 80 rectifier tube to melt. The heat caused by the short left the tube elements intact while burning a hole through the glass.



RADIO NEWS



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Negative

Feedback Compression

Experimental reports on a simple compressor circuit. With slight circuit changes it can be converted into an expander.

By

J. T. GOODE

Asst. Chief Eng., Packard-Bell Co.

THE use of compression in an audio amplifier increases the average operating level without exceeding peak overload. This allows a higher average of modulation percentage without overmodulating on the peaks. In recording, a higher level may be maintained without overcutting on peaks. In public address work, the amplifier may be operated at a higher level without causing increased distortion due to peaks.

The usual method of creating compression is to rectify an audio signal which originates in the amplifier and feed this negative rectified voltage back to the input stage. This causes the bias to vary and the over-all gain of the amplifier to change.

This type compressor has the following limitations: As the bias increases, the harmonic distortion increases likewise. Proper design will maintain this distortion at a low level. If improper values are used in the circuit, it is not uncommon to experience a distortion increase between 7% and 10%.

The bias-type compressor usually requires a rectifier tube and a pentode amplifier stage. If a high μ instead of a variable μ pentode is used, a higher level of harmonic distortion will result as compression voltage is applied.

The filter network creates a time delay problem. If the filter network is adjusted for a minimum of time

delay, regeneration or actual oscillation may result. Regeneration will cause the over-all frequency response of the amplifier to change as the compression voltage is applied. Oscillation due to the filter network, of course, cannot be tolerated.

This method of compression is capable of creating compression voltages far in excess of practicability.

The negative feedback compressor has the following advantages and disadvantages: As compression is applied, the harmonic distortion content decreases instead of increasing. The over-all frequency response of the amplifier will change if the over-all frequency response is not reasonably flat. If the over-all response of the amplifier is flat, the amount of frequency response change will be minor and may normally be discounted.

As the compression is applied, the harmonic distortion decreases. After certain limits are reached, the distortion will increase and approach the normal distortion level at no compression.

The negative feedback compressor requires the addition of a 6SN7 type tube but does not require a pentode amplifier stage in the circuit.

The addition of this type of compressor circuit to an amplifier reduces the over-all gain of the amplifier by approximately 3 db. This characteristic is undesirable, but most amplifiers

have reserve gain in excess of 3 db, and the loss of gain may normally be tolerated.

The amount of filter necessary for this type of compressor may be considerably less than that required for the negative bias-type compressor, therefore reducing time delay to a minimum.

Fig. 3 consists of a set of curves created by measuring power output, distortion, and frequency simultaneously at various levels of compression as well as without the compressor circuit. The top curve indicates the frequency response and distortion of the amplifier without the compressor circuit. The second curve indicates the same measurement with the compressor circuit attached but no compression applied. The third, fourth, and fifth curves indicate distortion and frequency response at 2, 4, and 5½ db. compression. The input level was maintained constant for all measurements.

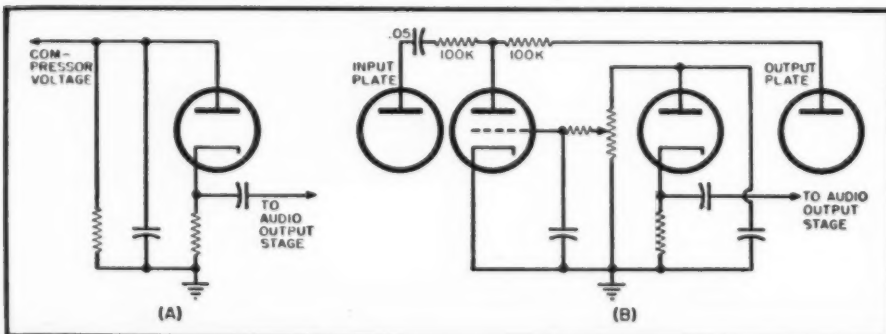
The audio amplifier consisted of a 6SQ7 driving a 6V6 with 3 db. of negative feedback being applied to the cathode of the 6SQ7. The frequency response of this amplifier was flat within .5 db. between 50 and 5000 cycles. When the compressor circuit was attached with no compression voltage applied, the frequency response improved to .2 db.

The distortion level increased by approximately 1% with the exception of 50 cycles and decreased 2.3% at that frequency. If the original negative feedback to the cathode of the 6SQ7 were removed, the addition of the compressor circuit would cause a decrease in distortion instead of an increase. Since the distortion increase was only 1%, no effort was made to determine what actually caused the increase.

The over-all gain of the amplifier will determine the amount of compression that may be obtained by this type of circuit. The circuit values indicated in Fig. 2 resulted in a maximum of 5½ db. compression. The over-all voltage gain of the amplifier was 580.

The operation of the compressor cir-

Fig. 1. (A) Simplified circuit of diode rectifier stage. (B) Fundamental circuit of the negative feedback compressor. Maximum available compression is 5½ db.



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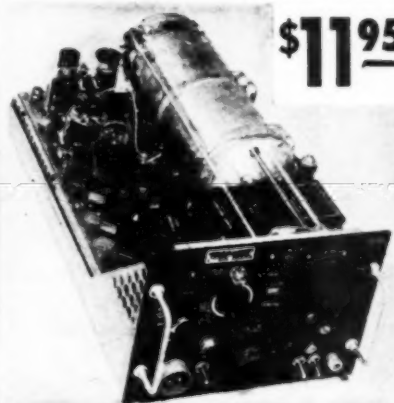
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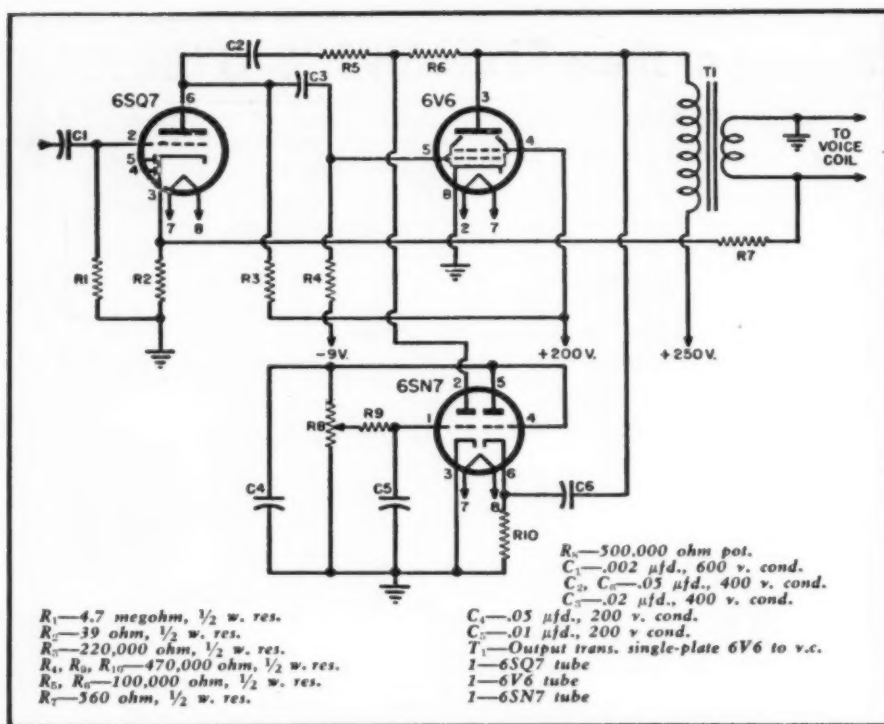


Fig. 2. A 6SN7 tube is used in the compressor. Circuit shows how it is wired into a two-tube amplifier. With slight revisions, compressor can be converted into an expander.

cuit is as follows: Fig. 1A consists of a diode rectifier which will supply negative voltage. The amplifier output is fed into the cathode of the rectifier. In a normal bias compressor circuit the negative voltage created by this rectifier would be filtered and fed into the grid of an amplifier tube, which would result in changing the over-all gain of the amplifier.

Fig. 1B is the fundamental circuit of

the negative feedback compressor. Here the same type of rectifier is used and the bias created by the rectifier is connected to the grid of the control tube. The cathode of the control tube is grounded. The plate of the control tube is connected to the center tap of the two negative feedback resistors. The negative feedback circuit consists of a .05 μ fd. condenser and two 100,000 ohm resistors all connected in series.

This negative feedback circuit is, in turn, connected to the plates of the amplifier tubes. Positive voltage is applied to the plate of the control tube through the 100,000 ohm feedback resistor which connects to the plate of the output tube. The .05 μ d. condenser removes the d.c. potential from the amplifier input tube plate. The value of this condenser is not critical but must be large enough so a low frequency response increase is not created.

The control tube simply becomes a variable resistor. When bias is eliminated from the control tube grid, the tube draws a maximum current, reducing the negative feedback to a minimum. If negative voltage is applied to the control tube grid, the plate current drawn by the control tube is reduced which, in turn, increases the amount of negative feedback. When the bias is increased to cut-off, a maximum amount of negative feedback is applied. The potentiometer in the grid circuit of the control tube regulates the amount of bias applied, therefore controlling the amount of compression.

Since the control tube acts as a variable resistor, the grid filter network is not critical since a certain amount of rectified voltage can be tolerated. This makes it possible to adjust the time delay to practically any desired amount.

The .05 μ f. bypass condenser from the plate of the rectifier to ground completes the rectifier circuit as well as creates a certain amount of filter action.

The use of a 6SN7 type tube for this circuit makes it possible to accomplish rectification and control in one tube.

Fig. 2 is a circuit diagram of a complete amplifier and compressor with circuit values. Amplifiers using other type tubes will require different values of negative feedback resistors. The exact value of these resistors will be determined by experimentation.

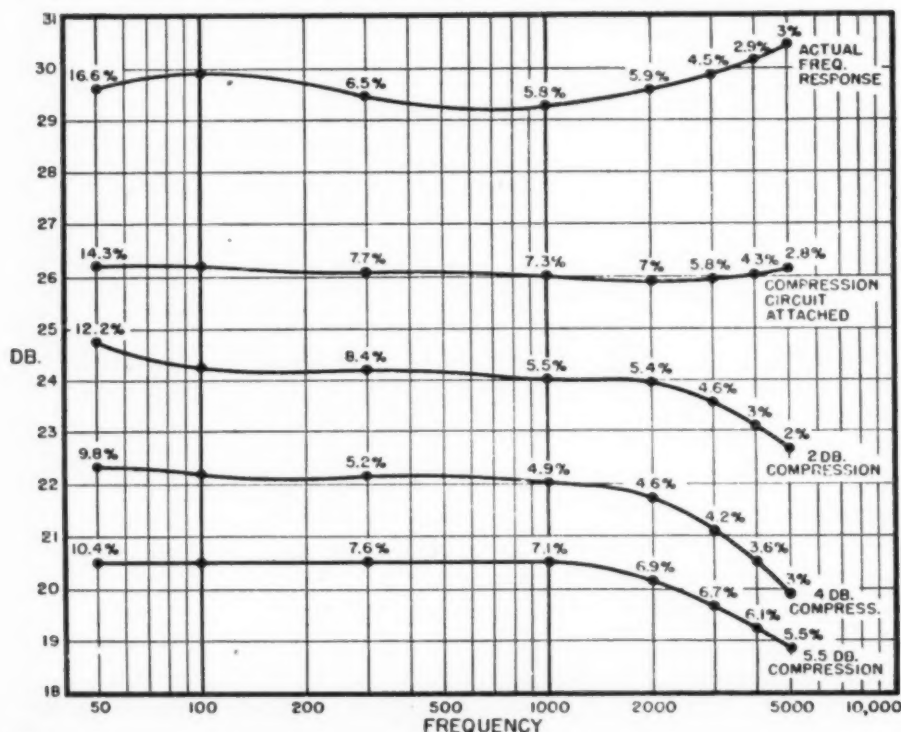
If the compressor circuit is to be applied to an amplifier utilizing high-gain tubes, the value of the negative feedback resistors will increase. If the increase is in the order of 500,000 ohms or more, more control may be obtained by changing the compressor tube from a 6SN7 to a 6SL7 type tube. Socket connections for these two tube types are identical.

This circuit is not restricted to two-stage amplifiers, the only requirement being that the negative feedback circuit be capable of center tapping and supplying plate voltage to the control tube.

Another method of applying negative feedback to the same type circuit is to increase the cathode resistor of the 6SQ7 from 39 ohms to several thousand and connect the feedback circuit from the cathode of the 6SQ7 to the plate of the 6V6. Increasing the cathode resistance of the 6SQ7 results in reducing the over-all gain of the amplifier. On the other hand, it will

(Continued on page 138)

Fig. 3. Frequency response curves for various degrees of compression. Percentage figures indicate total harmonic distortion present. Input level was held constant.

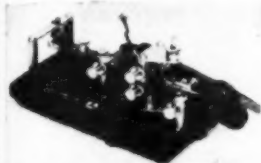


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(All relays shown for 115 v 60 cycle operation)

A. Duncan ADBT8 (8BX); DPST, contacts

30 amp @ 115VAC; list \$9.75. **\$3.68**

B. Duncan 84XXH; DPST norm. closed; 30 a.

cont. **\$3.88**

C. Duncan 58BX; 2 relays on base 3"x3 1/2"

each with one pr. 6 amp. contacts norm. closed, 2 prs. norm. open. **\$4.88**

D. Time-undervoltage, G.E. No. 12PCV14A1,

interchangeable w/ PQ26Y7, instantaneous action. **\$23.85**

E. Time delay, Price Bros., adj. from 3 to 36

sec. in 3 sec. intervals; w/cover. **\$12.95**

F. Antenna relay, insulating insulation, 2"

between 1/4" silver contacts. **\$2.50**

G. Overcurrent, W'house type MN, range

.04-16 amps DC; also (1) type 8V voltage relay, range 55-125VAC & (1) type 8C-M, 2-1.0 amp. Choice. **\$13.95**

Antenna relay 6VDC Galvin, 10 ohm. **\$1.50**

6VDC DPST Galvin, 17 ohm. **\$1.25**

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freq. 5675 to 8650 kc in 25kc steps (channels 270 to 389 f/B-659); 6 for \$5; each. **\$1.00**

Complete set of 120 xtals covering

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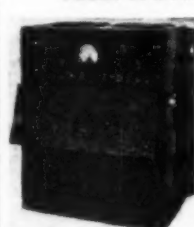
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115V AC RELAY COIL, 375 ohms, 2 1/2" od, 1" id. **\$.45**

"MATCHSTIX" C-D miniature tubular by-pass

1/4"x1", rated 300 v; .001, .002, .004, .01 mfd; any size, ten for. **\$.79**

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RECHARGER,

Raytheon W-3155, input 95-130V 60 cps; rated

output 22 to 24 volts (11-12 cells) 3 amps

continuous; maintains constant DC voltage to

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Crates, \$115.00

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V. limiter, approx. resist.

at 80°F is 1400 to 3000

ohms at 0.1 v, and 7.5 to 20

ohms at 1.5 v; used to prevent

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2" od x 3 1/4" lg. With

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part of

B. PA Coils

2" od x 3 1/4" lg. These Freq:

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Following have internal var. cond. and

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13.5-14.37 and 21.25-22.1 MC. **3.85**

C. Form, ribbed pore. 5 1/2" lg x 2 1/2" d, stand-

offs. **.69**

D. 20 Meter center link 100-watt plug-in B&W

E. Final Tank for BC-610 xmtr 500W plug-

in fixed link; 2-3.5, 3.5-4.5, 4.5-5.7, 5.7-8

and 11-14 MC. **1.19**

F. Form 3" od x 4 1/4" lg lo-loss w/bracket. .29

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BUD NC-852 for 807, 6L6, 1" plates, .5-9mmf. \$0.79

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TRIMMER, silvered ceramic 3-13 or 5-20

mmf; ea. **.20**

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500mmf 8000v, 3 a @ 300kc. **\$3.35**

.0045mfd 5000v, 9 1/2 a @ 300kc. **3.39**

.1mfd 2000v, 20a @ 20,000kc. **2.39**

VARIABLE CONDENSERS, 500mmf Nat'l

EMC500. **\$1.00**

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3 Gang Cardwell, 160mmf per sect, trimmers. **1.85**

50mmf double-spaced H'lund MC-50-SX. **1.25**

MICAS, 100 astd receiving incl silver

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RHEOSTATS, 100 ohm GR No. 214-A prec. pot.

25 Watt, 70, 100 or 125 ohms; choice. **.69**

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150 Watt, 200 ohms. **\$3.95** 300 Watt 700 ohms

500 Watt, 2 ohms Ohmite Model R. **\$5.85**

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6 plates, input 18v, output 12vdc @

220ma full-wave. **\$1.00**

24 plates, input 216v, output 110vdc @ 1.57a. **\$5.88**

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ma 107 ohms (GE). **\$1.65**

B. 4v @ 16a, 2.5v @

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@ 10ma. **3.65**

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No. 1138 similar to "D". **2.65**

CHOKE 20h 150ma Thord T74C29 shopworn.

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RF CHOKES, 1.14mh 3 pl, 10 for. 1.00

1.8mh 300ma 4 pl. **.29**

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EARPHONE, single loZ unit from H8-33, used. .25

SPEAKER or MIKE, sensitive 2 1/4" magnetic; dural cone. 1.00

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7mfd 600v. **\$0.75** .01mfd 5000v. **\$0.98**

2 1/2-2 1/2-5mfd 600v. **.75** 4mfd 12,500v test. **5.95**

3mfd 4000v. **4.85**

EE-8 TELEPHONE.....\$5.95

With handset, generator, ringer, etc., in leather or heavy web case (please do not specify). Fine for garage extension, farm phones, warehouses, etc. For local or common battery lines. "Each phone tested before shipment."

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RELAY, "A" power, 6vdc DPST No. 59B81111. 1.25

RELAY, antenna, 6vdc DPDT No. 59K81693. 1.50

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First IF-Xtal, H'lund part 8A-64. **\$1.50**

Second detector input, H'lund No. 8A-71. **1.25**



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Type BC-653-A, 2 to 4.5 Mc, 100 watts cw, 22 1/2" watta phone. Tubes include 1613 MO, 807 buffer, two 814's in parallel for PA, 1613 modulator. Gov't cost \$1227. Your last chance to get this fine set at such a ridiculous price. **BRAND NEW** w/tubes and diagram, less dynamotor. **\$29.00; w/o tubes. \$15.00**

New Tubes in Original Cartons

1E5GP bulk\$0.63 6K7G. **\$0.40 45. \$0.37**

1J6G. **.59 617. .73 77. .40**

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3FB7. **1.10 68C7. .63 83V. .63**

5GP1. **2.75 6U7G. .44 VR/150-30. .55**

6AK5 blk. **.47 6V6GT. .45 884. .57**

6B8. **.47 10V. .73 1635. .55**

6D6. **.43 12C8. .57 2051. .57**

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REMOTE CONTROL UNIT

RM-12; good for commercial or amateur stations. Has handset,

ringer, generator, Weston 301 (or equiv.) db meter. Contains

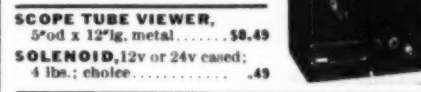
EE-8 'phone. Used. **\$11.95**

RM-13; same as above but includes 115 V 60 cps power supply,

one tube amplifier; w/2 tubes. Used. **\$14.95**

SCOPE TUBE VIEWER, 5" od x 12" lg, metal. \$0.49

SOLENOID, 12v or 24v cased; 4 lbs.; choice. .49



A. Push-Pull Input, pri

3000, sec 12M ohms et,

500-15M cps ± 3db \$1.45

B. Power, pri 115v 60cps;

sec 400vct 45ma, 6.3v

.6a, 6.3v 1.8a. **\$1.45**

C. Choke, 5h 225ma 112

ohms GE. **\$1.95**

D. Filament, 2.5v 10a oil-

filled Lionel. **\$3.88**

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All parts included, except low voltage D.C. supply. Kit has a focus control for use with 5TP4 projection tube. A specially built plexiglas frame to minimize corona discharges is included, which also houses RF coil and voltage tripler tubes. Voltage output is variable from 12 KV to 40 KV.

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f1.9—5 inch focal length corrected for curvature of tube. Will project pictures up to 6 x 8 feet. Send for details and prices!

SPELLMAN TELEVISION CO.

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Guided Missiles

(Continued from page 40)

One guided missile may be used in two or more of the above classifications. For example, an air-to-ground missile may be successfully employed as an air-to-ship weapon. This does not necessarily mean that the same type may be used efficiently for both military and naval purposes because the launching conditions are often different and the tactical considerations present entirely different problems. Thus, a guided missile which can be launched from a heavy bombardment airplane may be too large and heavy to launch from a comparatively small carrier-based airplane. In the same manner, a missile which may be fired from the ground against airplanes may be too large and heavy for a ship to launch against enemy suicide airplanes. Furthermore, in many instances it would be a waste of valuable armament to launch a large guided missile against a relatively small or unimportant target when the same weapon may be needed later for an appropriate target.

Classification According to Method of Propulsion

A missile may be dropped from an airplane like a rock, in which case it merely possesses the altitude and speed given to it by the flight of the airplane, and it is brought to earth by the force of gravity. It may be fired from a gun aboard an airplane, it may be launched from an airplane by means of a rocket, or it may be given an initial acceleration by means of a rocket motor and thereafter be self-propelled.

It is obvious that any of the methods used for launching a missile from an airplane can be used for ground launching except a method which depends on the force of gravity. Of course, in theory, a missile could be launched from a high tower erected on the ground but structural limitations make this foolish, although it must be remembered that this method was used in ancient times.

We now come to a method of propulsion which is suitable for missiles launched from either the ground or the air, and this is the use of self-propulsion, which simply means that the missile contains a power plant of some description. The power plant may be a reciprocating engine with a propeller, a gas turbine with a propeller, a turbojet motor, a ramjet motor,

The KUN-1 or "Gorgon IIC," a catapult-launched, jet-powered guided missile, is shown mounted on a movable rack.



RADIO NEWS

an aeropulse motor, or any other kind of power plant which will drive the missile along its path through the air.

The missile may or may not have aerodynamic surfaces, that is, it may or may not have wings, ailerons, a rudder, an elevator and other surfaces



The "Glomb," Model LBE-1, a television-controlled glider-bomber which can withstand a speed of 300 m.p.h. in a 4G dive. This is one of a trio of pilotless craft of the same guided missile family, the others being the "Gorgon" and "Gargoyle."

for controlling its flight path. For example, glide bombs have been used, both with and without wings, and it is possible to use rockets, either with or without wings. Pilotless aircraft using conventional types of power plants are too slow to be effective and too large to escape enemy detection and destruction, hence they may be eliminated from our classification of modern, practical, guided missiles. Bullets, bombs, and artillery projectiles as we have known them in the past should be eliminated from our thinking because they are not adaptable to self-propulsion. In general, modern guided missiles fall into two principal classes: (1) Rockets, either with or without wings; and (2) Pilotless aircraft with some form of jet propulsion.

Classification According to the Method of Control

Before we approach the control of guided missiles, we should have a basic understanding of the control of conventional airplanes. The aileron is a hinged, movable portion of a wing, the principal function of which is to impress a rolling motion on the airplane. By raising one aileron and lowering the other, the pilot can roll his airplane to the right or left. The rudder is a movable surface hinged to the trailing edge of the vertical stabilizer, used to steer the airplane right or left. The elevator, usually hinged to the trailing edge of the horizontal stabilizer, is used to raise or lower the nose of the airplane in flight. These three types of control surfaces control the three fundamental rotational motions of an airplane.

In order to relieve the pilot of work, the autopilot was developed. In its simple form, it may be set by the pilot on a course and thereafter it operates the ailerons, rudder, and elevator to keep the airplane on a straight and level path. Autopilots used in World War II were either hydraulically or electronically operated and were used in flight but were not extensively used for take-off or landing. However, autopilots are now developed so highly that they may be set on the ground and used from take-off to landing

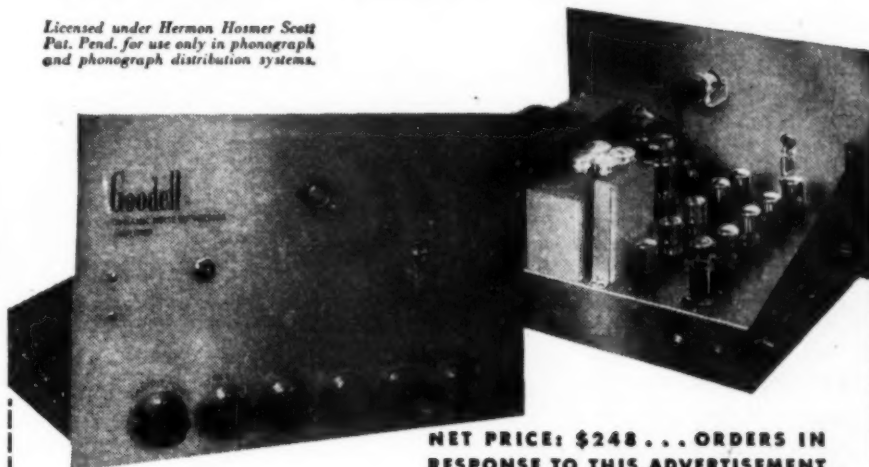
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and phonograph distribution systems.



NET PRICE: \$248... ORDERS IN
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SPECIFICATIONS

Dynamic Noise Suppressor is six-tube version of Hermon Hosmer Scott horizontal suppression circuits incorporating one voltage amplifier stage, one d-c control voltage amplifier, one dual control voltage rectifier, one low frequency inductive reactance tube, two high frequency capacitive reactance tubes—both using inductors in shunt circuits.

POWER OUTPUT

Six watts with less than 1% harmonic distortion; twenty watts with less than 3% harmonic distortion. (Note: Until standards are established for measuring intermodulation distortion, comparative ratings between manufacturers are not valid.) Intermodulation distortion is minimized by special circuit arrangements to a point where no "listening fatigue" is produced. Distortion at overload is "cushioned" and free of oscillatory disturbances.

FREQUENCY RANGE

Maximum—25 to 20,000 cycles per second, flat within one db. (Note: See Range Switch specifications.)

INPUTS

1. Phonograph high gain input stage operated entirely on d-c, compensated for record characteristics with G.E. variable reluctance or Pickering pickups.
2. Medium gain radio input. (500-ohm plug-in input transformer available.)

OUTPUT

Multiple voice coil and line impedances.

PANEL FINISH

Anodized aluminum, silver with gold lettering. Other finishes available on special order.

HUM LEVEL

Below audibility (—85 db below normal operating level).

TUBES

1—5U4G; 1—6SC7; 3—6SG7's; 2—6SJ7's; 1—6SQ7; 1—6H6; 1—6J5; 2—6L6's; 1—12SL7; 1—6AL7 (eye).

CHASSIS DIMENSIONS

13"x17"x3", aluminum.

PANEL DIMENSIONS

19"x10 1/2", aluminum.

PANEL INDICATORS

On/off pilot lamp. Dual G.E. indicator eye tube. One section indicates the operation of low frequency gate circuit; the other indicates the opening and closing of tandem high frequency gate circuits.

DYNAMIC NOISE SUPPRESSION CIRCUITS

One sloped low frequency gate type with dynamic control. Two "tandem" high frequency sharp cut off gate types with dynamic control. One 16,000 cycle per second sharp cut-off fixed (switch operated) filter tuneable to 10 kilocycles.

CONTROLS

Volume control.

Radio-phonograph switch.

Five position range switch.

(a) 20 to over 20,000 cps.

(b) 30 to 12,000 cps.

(c) 40 to 8,000 cps.

(d) 50 to 6,000 cps.

(e) 60 to 4,500 cps.

NOTE: Position (e) effective on phono input only.

Treble control—Continuously variable. Maximum boost 15 db at 10,000 cps.

Bass control—Continuously variable. Maximum boost 22 db at 50 cps.

Suppression—Continuously variable control of Dynamic Suppression. This control makes it possible to adjust the degree of suppression by controlling the ease with which the gate circuits will operate, to suit the surface and background noise characteristics of various records, as well as the preference of the listener.

NOTE: Facilities are provided for remote operation of range and suppression controls where such installation is desirable.

Amplifier may be ordered with ALL controls on 3 foot electrical extension cords with front plug-in facilities for convenience in custom cabinet installations. Special circuits compensate for added shunt capacitance in shielded cables, and no additional hum pickup is observed with these extensions.

This is a laboratory amplifier of the highest quality, designed and constructed to provide music reproduction fidelity limited only by the available signal, and loudspeaker equipment used.

NOTE: Controversies still exist between the advocates of triode output tubes and beam power amplifiers. The decision to use beam power output tubes in this amplifier was reached only after exhaustive tests and extensive research and design in connection with special degenerative feedback circuits and transformer characteristics to produce superior listening results. Cost was not considered as a factor in reaching this decision. The results obtained with beam power tubes were unquestionably superior, both in laboratory tests for intermodulation and harmonic distortion and in listening observations at comparable power levels.

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OHM CHEST

with 100 Insulated Resistors

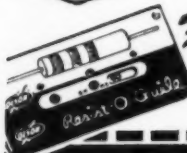
This handsome Chest has 20 compartments, 10 in the base and 10 in a removable tray. Walnut finish; brass hinges and fastener. Contains 100 resistors stamped with resistance values, 5 ohms to 20 megohms, 1/2 watt to 2 watts, color coded. Every size is popular!



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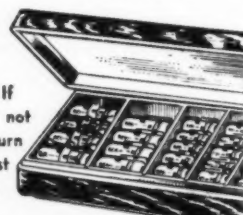
QUAN.	CAP.	VOLTAGE	LIST	TOTAL
2	10	25	\$0.75	\$1.50
2	25	25	.85	1.70
5	20	150	.95	4.75
5	40	150	1.10	5.50
4	20-20	150	1.30	5.20
5	8	450	.95	4.75
4	16	450	1.35	5.40
			2.45	2.65
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\$9.95

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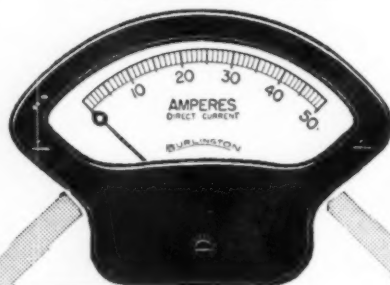
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without the intervention of a human pilot in the operation of the control surfaces.

Coming back to guided missiles, in World War II, the Germans used the types known as V-1 and V-2 with considerable success. The V-1 was a pilotless aircraft and the V-2 was what is technically described as an elliptical-trajectory rocket. Both of these were guided by autopilots. The operators determined the location of the target with regard to the place of launching, estimated the wind drift, computed the required settings and then applied these settings before the missile was launched. The operator had no control over the flight of the missile after it was launched and the missile did not receive any information, intelligence, or guidance from the target. The accuracy of its fall upon the target depended upon the accuracy with which the autopilot was constructed, the accuracy of its setting, and the computation of wind drift by the operator, although the latter factor was not as important in the case of the V-2 missile as it was in the case of the V-1. The only electronic feature was the operation of the autopilot, assuming that it was not of the hydraulic type.

The next step in the development of guided missiles was to use an autopilot but control it remotely by the exercise of the judgment of a human pilot. The human pilot had to keep both the missile and the target under observation constantly and exercise his remote control by means of radio. During the night or during foggy weather, this method did not work, and even during daylight hours, under conditions of maximum visibility, the anti-aircraft fire of the enemy and the interception of enemy fighter airplanes reduced its effectiveness.

Having achieved some success with radio-controlled guided missiles under the observation of the remote pilot, the next step was to install a television transmitter in the missile so that it could "see" the target, that is, it would transmit its reactions to the emission and reflection of light from the target, and thus enable the human pilot to direct its flight by radio. Obviously, if the emission and reflection of light from the target was weak, or if there were light rays from objects other than the target, the accuracy was greatly lowered. This limited the effectiveness of this method so much that the scientists turned their attention to the use of radar.

In theory, targets which give good radar reflections can be attacked regardless of the visibility, thus overcoming the objection to the use of television repeat-back information, and enabling the remote human pilot who has the necessary information regarding the range and direction of the target to direct the guided missile on an accurate flight to the target. However, if the target does not emit or reflect radar signals, this method fails.

Another theory is that if the remote human pilot knows the exact location of the target on a map, he can track

RADIO NEWS

the flight of the missile by radar, plot its course on the map, and then direct its course by radio so that it will dive at the proper moment and hit the target.

A third theory is that a radar beam may be directed along the path which the missile is to follow. In this case, the missile must carry equipment which will enable it to follow the radar beam. The advantage to this theory is that if the target, such as a ship, an airplane, or any other movable enemy object, changes its position, the radar beam may be directed to the new course of the target and the missile will still strike the target. Again, a human pilot must be on watch from the moment of launching until the fall of the missile on the target.

These theories based on the use of electronic equipment have been seriously considered by scientists for several nations, but the necessity for controlling the missile by the exercise of the judgment of a human pilot has not been as attractive as the possibility of developing a missile which would automatically seek the target.

Target-seeking guided missiles are sometimes called *homing missiles*, but this term suggests the return of the missile to its launching point, hence it is better to refer to them as "target seeking."

Although electronic engineers play a vital part in the development of guided missiles, they are broad enough in their thinking to consider all physical laws in searching for new methods. For example, they have discussed the possibility of guiding missiles to their targets by means of the emission or reflection of sound at the target. This depends upon the intensity and direction of the sound at the target. Battlefield noises, and even the ordinary industrial noises, reduce the effectiveness of this method, but the problem becomes hopeless of solution when it is realized that the missile itself produces noise, both internally and externally, as it travels through the air.

The emission of light from flares or searchlights, contrasts between light and dark areas, and similar light conditions at the target could be used as sources of guidance for target-seeking missiles but here again we would be faced with the obstacle of varying conditions of visibility.

The emission of heat rays from the smokestacks of ships, industrial plants, and similar targets, may be used as a source of guidance, but this method is limited because of varying weather conditions, and fluctuations in the generation of heat at the target.

Heat and light are both within the electromagnetic spectrum, hence they emit or reflect electromagnetic radiation, but they do not do either as well for our purposes as radar, which is reliable night or day, regardless of weather.

In the application of radar to the control of guided missiles, two entirely different systems have been tried. In

January, 1948

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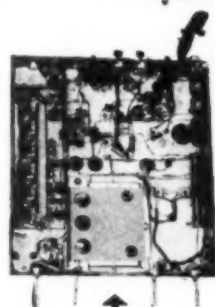
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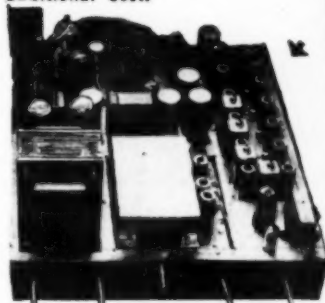
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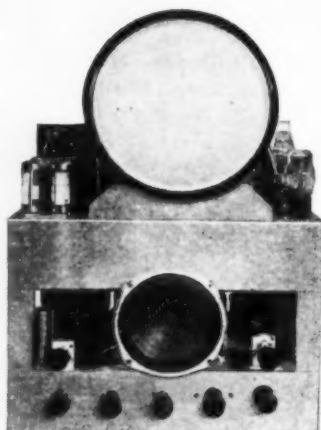
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one, the missile contained only a receiver. The transmitter was on the "mother" airplane and emitted short pulses of high intensity. Mechanisms within the missile which kept it pointed toward the target were activated from the returning echoes.

In the other type of radar-controlled missile, the missile is set for a particular target, released, and then it automatically follows every movement of the target until it strikes, leaving the mother airplane entirely free to go on another mission.

The principle underlying the operation of this fully automatic target-seeking missile resembles that used by a live bat which gives out short pulses of sound and is guided by echoes from the sound, thus avoiding collisions in the dark. The missile emits pulsed microwave electromagnetic radiations and is guided by the radar echoes from the target. Since the missile can follow every movement of the target, it is possible to say that the radar robot pilot inside the missile can "see" the target under all conditions of visibility.

A missile of this type can be carried under the wing or fuselage of an airplane and released several miles from the target. The usual procedure is to first locate the target by means of the standard search radar carried by the airplane. The airplane is then flown toward the target and the radar transmitter and receiver in the missile are aimed in the same direction. Target information received and transmitted

from the radar in the missile is displayed on a special indicator in the airplane and controlled by the operator. As soon as the radar equipment can be manually adjusted to the prevailing conditions, it is switched to automatic tracking and the missile is released.

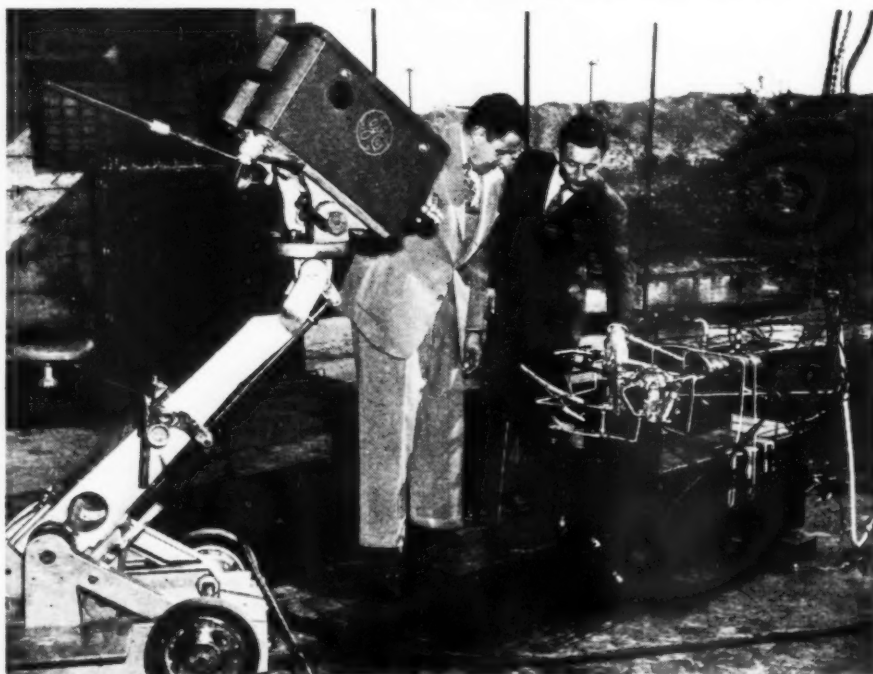
Echoes from the target are continuously detected by the radar receiver installed in the missile. The flight control units receive corrective signals from the output for the purpose of guiding the missile toward the target.

The advantages of this fully automatic, target-seeking missile are as follows: (1) The self-guiding feature enables the launching airplane to go on another mission and maneuver as desired; (2) The self-guiding or homing feature increases the accuracy; (3) Heavily armed targets outside the anti-aircraft range may be accurately attacked.

The system just described was installed in the "BAT," the first fully automatic guided missile successfully used in combat by any nation. It was one of several guided missiles developed by the National Bureau of Standards under the sponsorship of the Bureau of Ordnance of the Navy Department and has led to further research on advanced designs.

Statements in this article are the personal opinions of the author. They are not to be construed as necessarily reflecting the official opinions of the Navy Department or the naval service at large.

C. G. Pierce of Los Angeles, electronics engineer for the General Electric Company, and B. L. Dorman, chief test engineer of Aerojet, view the television installation in the test pit prior to televising the test of firing high thrust rocket motors at Aerojet Proving Grounds. Developed by Aerojet engineers, this method of televising rocket motor tests was successfully demonstrated with the cooperation of engineers of General Electric Company who furnished the television equipment. This method, used for the first time anywhere, provides safety from the hazard area to observers located in a remote room who may view the tests with added advantages of better lighting and close-ups never before provided.



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India—For West U. S., AIR, Delhi, 15.16, 9.59, 0900-1100, news at 0930, 1030; and 15.19 from 2100 on. For East U. S. listeners, 15.19 at 2130; 15.19, 15.16, at 2230; 11.87, 9.67, at 0730.

Italy—For East U. S., *Radio Italiana*, 15.12, around 1910-2010.

Japan—For West U. S., Tokyo, 6.015, 0200-0900, relaying AFRS (WVTR) programs; 9.605, 0000-0330, relaying WVTR; JYW2, 9.505, JKC, 7.258, JKA, 7.285, 0330-0830 (Home Service). For East U. S., best possibility is the 6.015 outlet around 0400-0700.

Java—For East U. S., *Radio Batavia*, 18.600, 19.345, 1145-1200, and on 15.145 and 9.55 at 0530. For West U. S., 11.44, 0930-1000.

Korea—For West U. S., JBBK, 4.40, 0500-1000 (no English).

Malaya—For East U. S., Singapore, 9.69, around 0500-0715. For West U. S., 9.69, 0300-1200 (news at 0645, 0915, 1100), also on 6.77.

Philippines—"Voice of America in Manila," 11.84, 0430-1005 (is QRM'd by Australia's VLC7, 11.84, in period 0800-0915).

Sweden—For East U. S., SBT, 15.155, 1000-1100; and SDB-2, 10.780, 2000-2100. For West U. S., SBT, 15.155, 0140-0500 (Home Service).

Switzerland—HER5, 11.865, Berne, 1730-1815, 2030-2230; HER4, 9.535, 2030-2230.

U. S. S. R.—For East U. S., *Radio Moscow*, 15.17, 1820-1930 and 0745-0815. For West U. S., 15.17, 1820-1930; also 9.565, 0300-1000 (beamed to Orient).

Best bets for listeners in the mid-West (particularly the Chicago area) include Brazzaville, Quito, Manila, Nanking, Leopoldville, *Radio Italiana*, Paris, Berne, *Radio Australia*, *Radio Dakar*, Stockholm, Moscow (see schedules above and in "This Month's Schedules").

For more detailed information on the short-wave spectrum, short-wave reporting, amateur codes and abbreviations, identification of short-wave stations, and so on, readers are referred to the Shortwave Listeners' annual, published by the Amalgamated Short Wave Press, Ltd., 57, Maida Vale, Paddington, London, W.9, England.

In conclusion, our very best advice to the "beginning" SWL is to *tune carefully, report adequately, be patient, and persevere!*

Verification Data

Due to so many requests from U. S. listeners for information about the policy of the U. S. Department of State in verifying "Voice of America" reception, I quote below a letter from Kay Bailly, Chief, Listeners Relations Branch, OIE-IBD, Department of State, New York City:

"Concerning your question as to verifications for listeners within the U. S., you are correct. The activities of the International Broadcasting Division (The Voice of the United States of America) are confined by Congress to international broadcasting to other

January, 1948



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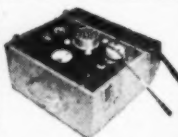
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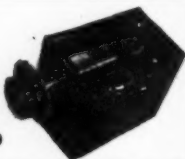
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"Our activities, therefore, must be confined (due to budgetary limitations) to those areas and audiences for which international broadcasting is specifically intended. The importance of verifying for listeners in the U. S. as well as internationally, is not overlooked, and it is our hope that some arrangements can be made to handle this activity within the next year."

Raymond Block, Antwerp, Belgium, writes: "I have just received a verification in form of a nice card (view of Moscow) from Radio Moscow with schedule of programs in English. I wrote to this QRA: Radio Moscow, Overseas Service, English Program, Moscow, U. S. S. R." Mr. Block said his report was sent in English and was verified in that language in 42 days; no IRC was used. (Has any one else received a reply from the U. S. S. R.?)

In verifying by QSL card and letter, Radio Brazzaville officials stated that "Whether return postage is included or not, we will always reply, by air-mail if the listener specially wishes." Radio Splendid, LRS1, Ayacucho 1556, Buenos Aires, Argentina, QSL's by letter in English; VY7RB, Radio Sucre, Cumana, Venezuela, verified by a letter in Spanish, gave frequency as 3.470. Radio Mediterraneo Valencia says EAJ3 is "nonexistent"; says the station has no call letters. CXA-19, 11.835, Montevideo, verified with a picture postcard and beautiful folder, gave schedule as 0600-2200. (Kneitel)

This Month's Schedules

Albania—Dorothy Sanderson, Australia, reports ZAA, 7.852, Tirana, with news at 1615.

Algiers—The 11.835 outlet is heard on West Coast from 0130 on. (Balbi)

Angola—CR6RS, Radio Benguela, is heard in South Africa from 7.10 around 1400-1500; station can be identified by five tingling chimes at 1500, with the call, "Radio Club de Benguela, Angola." (Radio Week) CR6RL, 15.895, Luanda, gives program schedule at 1330. (Brownless)

Argentina—A letter from the Ministerio del Interior, Buenos Aires, states that power of LRA will shortly be increased to 50 kw. which is the maximum output of the transmitter. (Holmberg)

Australia—Widely reported (from Sweden, Chicago, Eastern U. S.) is VLH3, 9.58, heard to 0900.

Austria—Swedes report Dornbirn moved from 6.005 to 5.990. (Nilson)

Belgian Congo—Leopoldville, 9.745 (with 11.645 in parallel but not announced), beams to Britain, 1530-1645, news at start. (Pearce)

British Honduras—URDXC reports ZIK2, 10.598, Belize, as heard at 0830-0856; regular daily schedule is 1330-1345 or later.

Bulgaria—Sofia, 9.350, has news at 1650 now (formerly this was only radiated on medium-wave although was listed for short-wave transmission), in addition to the regularly heard news-cast at 1530.

Celebes—Radio Makassar, YFA4, 9.265, is now being heard in Sweden to 0932 sign-off, gives call in Dutch and English. (Nilsson)

Ceylon—ZOH, 4.897, Colombo, appears to relay BBC news at 1100; signs off at 1200 with "God Save the King."

Radio SEAC, 15.12, 17.77, in the Sunday beam to Britain, is now scheduled at 1330-1530 since Britain returned to GMT.

China—Chinese stations have returned to standard time; thus programs are now 1 hour later than during summer and fall.

Dorothy Sanderson, Australia, reports a Chinese station with a call of XTRA as heard on 9.73 at 0545; not XGOA; she reports XGOA on this channel at 0445, however.

XGOY, 9.663, has improved signal mornings in East; news, 0700. On 11.913, now is scheduled 0500-0630 and 0845-1040; news, 0900 (relayed from XGOA), 1000; good signal in first transmission, last is marred by terrific CWQRM.

Best signal from China mornings is XGOA, 11.835, which has news at 0900; has some sideband QRM from Australia's VLC7, 11.84, but usually can be separated during the time Australia is beaming to North America (0800-0915). The evening transmission on this channel, beginning at 1930, appears to be inaudible throughout the U. S. due to Montevideo, Uruguay, occupying the same spot to 2300.

XRRA, about 10.260, Peiping, is still heard on this frequency. (Nilsson) Still audible in Eastern U. S. around 0700-0800.

URDXC lists XMAG, 4.275, Nanking, 2200-1000.

Czechoslovakia—OLR3A, 9.55, Prague, has fine signals in East afternoons; news at 1745; announces news to Europe at 1345 on OLR4A, 11.84 (Beck) The 9.55 outlet has news at 1545, 1645, 17.45. (Pelland)

The North American beam from OLR5A, 15.23, is now at 1900-2000, news around 1935. (Norris) At times appears to be jammed by Moscow. Have heard music on this one prior to 1900.

Dominican Republic—A verification

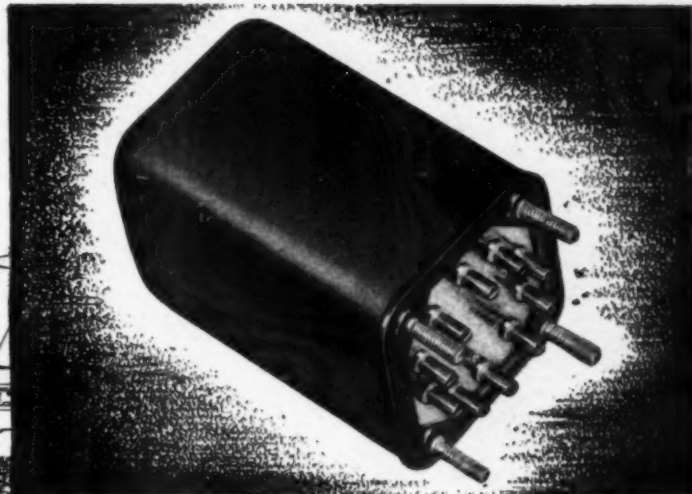
RADIO NEWS

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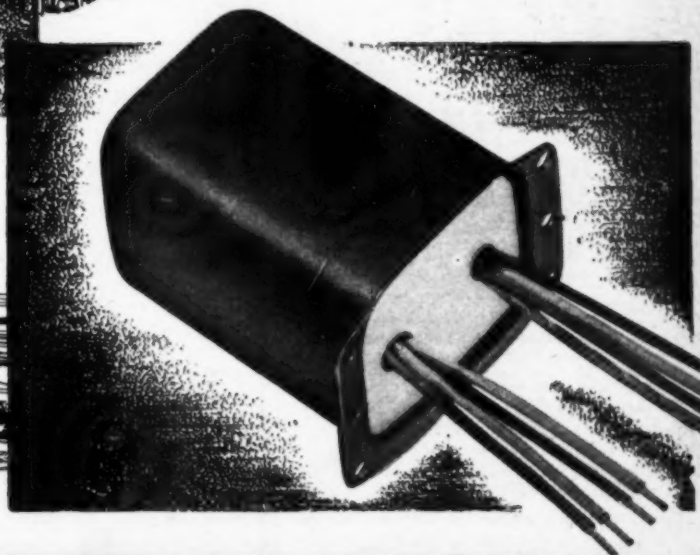
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50 to 10,000 Cycles, frequency response within $\pm \frac{1}{2}$ db up to 10 watts of power, within ± 1 db over 10 watts, throughout this range. Secondary impedances match 600 and 150-ohm lines, 16, 8 and 4-ohm reproducing systems. Listed are Driver and Output Transformers. *Sealed in Steel* construction, flange mounting, with solder lugs or wire leads.



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card from "La Voz del Yuna," stated that H13T (1040 kcs.) uses 10 kw. and that H12T (7.275 and 11.900) uses 7.5 kw. (Holmberg)

Dutch New Guinea—Radio Biak, on approximately 7.98, has good signal in Australia with AFRS programs at 0600; also calls Batavia. (Sanderson) Reported by NNRC on 7.960 to 0830 after changing from 7.200 at 0705; works Makassar at conclusion of broadcast (duplex)

Egypt—SUX, 7.865, Cairo, is heard with good level in Newfoundland at 1515-1630 sign-off. (Peddle)

Finland—OIX4, 15.190, Helsinki, still has news, 0715. (Pearce) OIX2, 9.500, varying, may parallel.

France—Latest schedule announced by Paris is 1645-1700, 15.24, 9.55 (both 100 kw.); 2115-2215, 9.68, 9.55 (both 100 kw.), and 11.845 (25 kw.) to North America. (Beck)

Paris is heard on West Coast on 17.766 from 0900 on; outlets of 17.85, 15.35, 15.24, are heard there 0145-0230. (Balbi)

French Indo-China—Hanoi, 11.90, is heard in Australia at 0645 with news in French; another Hanoi outlet on 10.20 is heard at 0700 with news in French, fair signal despite much noise. Pnompenh, 12.364, is heard there at 0700 with news in Chinese. (Sanderson)

Saigon's FZS, 18.388, is being heard well in Eastern U. S., 1030-1100, beamed in French to France; signs off with "La Marseillaise." (Kary)

Germany—The British-Controlled SW outlet on 6.115, varying, is officially listed as "Northwest German Radio," location Cologne.

Swedes report a new station in Munich, operating on 6.180, Fridays at 0530-0830 and 1030-1730; Saturdays, 0530-1800, Sundays at 0200-1800. (Nilsson) Could this be Radio Stuttgart, listed on 6.179? Or it may be actually Munich (listed as 6.190).

Guadeloupe—NNRC reports Radio Guadeloupe on 9.410, signing off with "La Marseillaise" at 2010; may be new channel.

Honduras—"La Voz de Lempira," HRA, 6.048, Tegucigalpa, is a new station, heard evenings. (Legge)

India—AIR, Delhi, is being heard well evenings in the East; news at 0930 on 15.19; at 1030 on 17.83, 15.29, 15.19, 15.16, 11.87. (Beck) VUD3, 17.76, Delhi, heard on West Coast, 0900-1100, news at 0930, in dual with 15.16, 11.87, 9.59; VUD7, 6.19, heard there from 0800 to 0930 sign-off. The 7.29 outlet is heard at 0900-0945 with native programs; 15.19 operates 0400-0600, among other times; 11.85 carries native programs, 0800-1030. (Balbi) The 7.290 outlet is heard in East at 0730 with news; the 7.260 channel in parallel at that time may be Madras.

Iran—Radio Tabriz, 11.960, is heard in Britain to 0700, news in French at 0615, in English at 0630. The period from this station formerly on 12.180, is now on 6.090, 1200-1300; news in Persian at start, then western recordings. (Pearce)

Ireland—Swedes report Radio Eir-eann, 17.84, at 1245-1300. (Nilsson)

Italy—Radio Italiana, 11.81, has English period now at 1430-1510, news at 1450. (Pearce) The North American daily beam on 15.12 is now at 1915-2010, news around 1950, good level; announces 6.085 in parallel. (Conley) So far no one in U. S. seems to have picked up the 6.085 outlet.

Java—PMW, 17.630, Batavia, is scheduled 1200-1245. (Alfred) Has news at start. (Miers)

Lebanon—Radio Beirut, 8.020, varying, is heard in Newfoundland at 1345-1600, but with bad CWQRM. (Peddle)

Madagascar—Radio Australia reports Tananarive on 10.615, 9.669, 6.063 as operating in parallel at 2245-0030, 0320-0545, 0920-1240. QRA is Office of the French-High Commissioner, Tananarive, Madagascar.

Malaya—Singapore's new 21.73 (listed 21.72) outlet is heard in Australia at 0415 with British Far Eastern Service, says Dorothy Sanderson, who also reports Radio Malaya, 6.010, at 0600 with news and music for local listeners.

Radio Malaya, 4.825, Singapore, is heard in Britain signing off with "God Save the King" at 1533, except Saturdays and Sundays, when runs to 1104, and on which days has headline news at 1100. (Pearce)

Monaco—Radio Monte Carlo, 6.132, is heard in Britain as early as 1645, has news in French at 1700, then gives program summary and leaves the air around 1715; has short dance tune as signature. (Pearce)

Mozambique—CR7BJ, 9.654, varying, is heard in East around 1600-1700 sign-off (In English).

CR7IB, 7.155, Beira, reports that it has been recently heard by listeners in the U. S. A., Europe, and Australia; to ascertain possibility of a special broadcast to Europe, U. S. A., Australia, and the Far East, a test transmission was broadcast at 0200-0330 on November 2; as far as is known at the time this is written, it was not audible in the U. S. If anyone did pick up this test transmission, a report would be appreciated by CR7IB, Beira, Mozambique. Mervyn Laubscher, South Africa, informs me that officials of Beira say they will soon purchase better, higher-powered equipment.

Norway—LLG, 9.610, is still being heard afternoons in Britain with good level; in verifying, gave power as 8 kw., name (or location) as Fredrikstad Kortholgekringkaster. (Pearce)

LLN, 17.825, Fredrikstad, was heard testing mornings, but seems to be off now. LLM, 15.175, Tromso, verified by card giving this as location of transmitter; is heard afternoons in Eastern U. S. LLG, 9.610, Fredrikstad, is heard in New York well at 1400-1700 with Home Service; this may be the new 100 kw. transmitter that has been under construction. (Legge)

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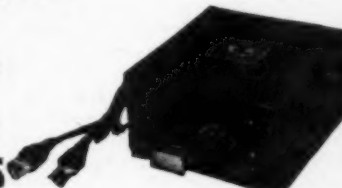
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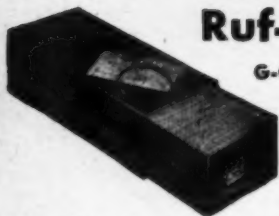


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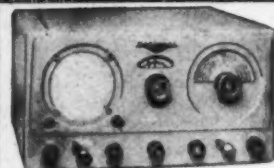


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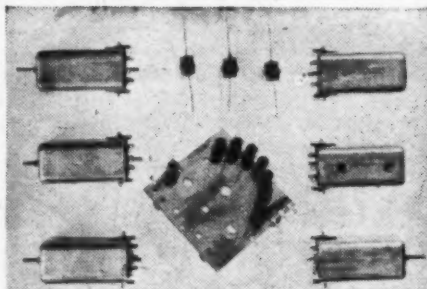
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Palestine—Jaffa's new 31-meter
outlet on about 9.645 is a powerful
signal in Britain afternoons around
1520, has news in Arabic at 1530, signs
off around 1542, but more recently as
early as 1532. (Pearce) The 9.645 out-
let is heard on West Coast mornings
around 1030. (Baxter, Dilg) In the
afternoon period, 6.790 parallels.
(Pearce)

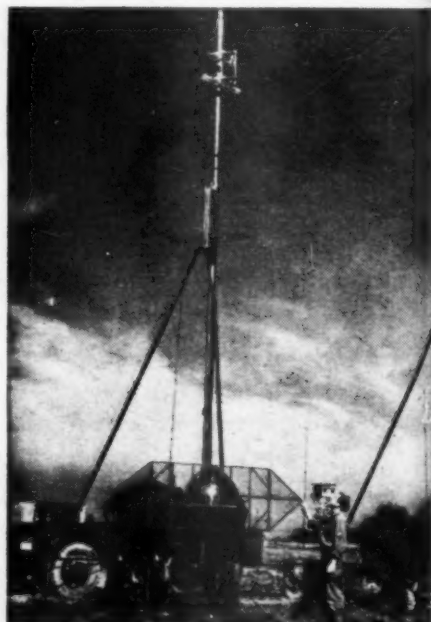
Philippines—A station heard morn-
ings on about 11.905 has been identi-
fied as KZFM, Manila, moved from
11.800 and before that on 9.515; poor
signal and fades badly. KZPI is still
on 9.500 "plus"; KZOK is now on high
side of 9.700. (Dilg) "Voice of America
in Manila," 11.84, appears to sign on
now at 0430, instead of 0400 as offi-
cially listed; has short news at 1000
and leaves the air around 1005 with
playing of "Star Spangled Banner."
(Balbi)

Poland—Warsaw, 6.100, now has
news at 1550 (winter schedule).
(Pearce) Swedes report Warsaw test-
ing on 7.170 to 0530. (Nilsson) Tests
begin at 0400. (URDXC)

Portugal—Call letters and frequen-
cies of Emissora Nacional, Lisbon, are
CS2MA, 6.374; CS2MB, 7.260; CS2MC,
9.635; CS2MD, 9.670; CS2ME, 9.680;
CS2MF, 9.727; CS2MH, 9.740; CS2MI,
9.940; CS2MK, 11.027; CS2ML, 11.040;
CS2MM, 11.840; CS2MO, 11.995;
CS2MP, 12.749; CS2MQ, 15.100;
CS2MR, 15.110; CS2MS, 15.120; and
CS2MT, 15.320.

Rumania—Radio Romana Libera,
6.210, varying, has been heard in New
(Continued on page 162)

When the "Big Push" landed at the Clin-
ton County Army airbase, this upright
antenna served as the guide path to
bring in the robot C-54. Sgt. R. M. Mc-
Kinley of Kenton, Ohio, takes a look at
the instrument which, combined with a
localizer, brought plane to a landing.



Television Installation

(Continued from page 59)

rious but, in most cases, the pattern-effect is stationary. The only practical solution of this type of interference is removal of the antenna as far as possible from the source of trouble. This may require an increase in elevation, resiting, or both, to varying degrees. In one instance (Fig. 4), it was only necessary to raise the antenna to a position about 6 feet above "noisy" power lines in order to entirely eliminate all objectionable interference.

Power or electric cords left on or near the receiver chassis may sometimes create "hum" interference (Fig. 5) due to leak-through in the video output stages of the receiver. Only removal of the electric or power cord may be necessary to clear the picture image.

Other typical sources of television interference are electric signs, neon signs, traffic signals, air conditioning and refrigeration units, dial telephones, doorbell buzzers, many household appliances, and other electrically operated instruments and devices.

The source of interference must be determined before direct methods of elimination can be attempted, because different types of interference usually require specific methods of suppression or elimination.

Preliminary Steps

Any "noise" disturbances of a particular location will first be noticed on the picture screen during siting and orienting of the directional antenna. With the appearance of such an effect, an attempt should be made by both members of the two-man installation team to determine the source of the interference.

If the nature or intensity of the picture distortion changes with a movement of the antenna, then use the antenna as a "noise probe" to detect the direction—and thus the location—of the source of trouble. Usually, however, this is only effective for "noise" originating from external sources and having marked directivity.

Most sources can be identified through direct association with nearby electrical apparatus or equipment. For example, if picture reception is impaired only during operation of a neon sign, the sign is the source of interference. Similarly, the television picture may be rhythmically affected by periodic operation of an electric flashing sign. Interference only during periods when a nearby elevator is in motion is an easy source identification. In like manner, vacuum cleaners and other household appliances, refrigerators, air conditioning units, and even doorbells can be identified by this process of elimination.

Interference may be entering the receiver via the a.c. power cord; that is, the actual source is unknown but is introduced into the receiver by the

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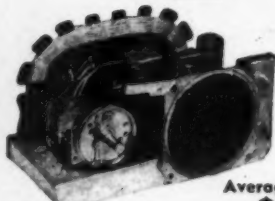
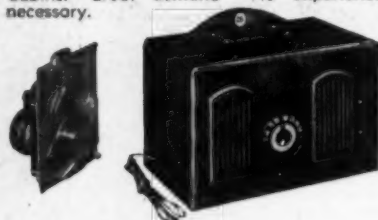
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power and light distribution system for the particular area. This possibility can be tested by inserting any of the several commercial types of a.c. line filters or line noise suppressors between the power cord and the a.c. outlet socket in the room. These filters should be standard equipment in the television installation kit. If the filter is effective in suppressing the "noise," it should be more securely attached as a permanent part of the installation.

If the interference persists, however, with the source still unidentified, an effort can be made during continuance of the installation to minimize or possibly eliminate the "noise" disturbance. However, at any time the source is identified or strongly suspected, all work should be concentrated on elimination or suppression of the "noise" according to the prescribed methods (Table 1).

Further Attempts

Try different positions or paths for the loose "twin-lead ribbon" lead-in between the antenna and receiver. Often, by rearrangement of this lead-in, it may be possible to avoid certain "noisy" parts of a house or building. If necessary—that is, in order to achieve "noise"-free reception—the lead-in may follow a long and circuitous path; but the lead-in must be properly matched to the impedance of the receiver as well as the antenna, and possible new sources of "noise" must be avoided. If the "noise" persists, regardless of the route, the "twin-lead ribbon" should not be permanently installed.

Next, considering the important factor of *directivity* needed for strong signals and for ghost-free reception, change the location of the entire antenna to a new site—as high as possible and as remote as possible from any suspected source of electrical interference. Then, proper orientation of the resited antenna may help to minimize the unwanted "noise." If the source of the interference can be determined, refer at once to Table 1 for proper procedure.

However, if these attempts fail or are impractical, it is obvious that the interference is of a serious nature requiring considerable additional installation work. Return the antenna to its original or best site. It should then be reoriented for best reception of the two channels preferred by the customer—temporarily ignoring, as best possible, the extraneous "noise" effects on the picture screen. When this is done, disconnect and remove the "twin-lead ribbon" lead-in from the vicinity of the installation.

Although adequate for most suburban and many urban installations, "twin-lead ribbon" is not a desirable lead-in for "noisy" locations. Required for such work is coaxial cable of superior quality. Either of two types, RG-58/U or RG-59/U, or their equivalents, are recommended for television installations. Both types have a rubberized insulation over a flexible (copper-woven) outer conductor (Fig. 6A).

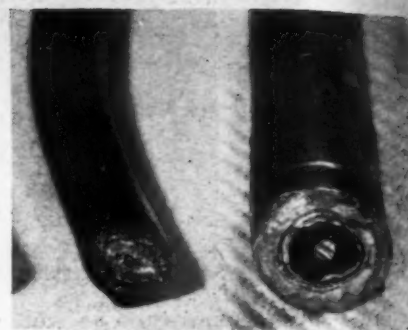


Fig. 6. Types of coaxial cable lead-in used to minimize possible "noise" pick-up. Rubber covered cable (left) is most popular. Lead-sheathed cable (right) is usually used only in large metropolitan or commercial type buildings.

For urban installations in extremely "noisy" commercial or industrial buildings, a heavier and more durable cable can be used (see Fig. 6, right). Bakelite spacers separate the inner conductor from the outer conductor, and the entire cable is enclosed in a heavy lead sheath. Normally expensive, several types of this cabling can presently be obtained through war-surplus channels at reasonable prices.

A coaxial cable is unaffected by nearby "noise" disturbances, and such a lead-in can follow any desired path between antenna and receiver. Since most types of cable are fairly heavy, it must be well secured at least every six feet and sharp bends should be avoided.

To be effective as a "noise"-free conductor, it is extremely important that the outer conductor of the coaxial cable be connected to a good ground at several, appropriate points along the lead-in.

When properly installed and matched to both receiver and antenna, such a lead-in will prove to be an almost perfect conductor. Since many types of "noise" interference reach the television receiver via the lead-in, use of coaxial cable is recommended for all "noisy" locations and will invariably minimize such effects on the screen.

After installation of this lead-in, all signals reaching the receiver are affected only by the elements of the antenna. If not already known through the above technical operations, the source of any remaining "noise" disturbance can be identified easily by orienting the antenna for maximum "noise" effect. This condition results when the principal dipole element is broadside to the source of interference.

Although "noise" disturbances can be minimized and suppressed indirectly by any of the means described, whenever possible and practicable such interference should be eliminated at its source—usually the quickest and easiest way. (See Table 1.)

However, any method is acceptable if it results in adequate reception of television signals, free of ghost interference, and free of "noise" interference.

(To be continued)

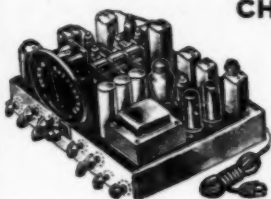
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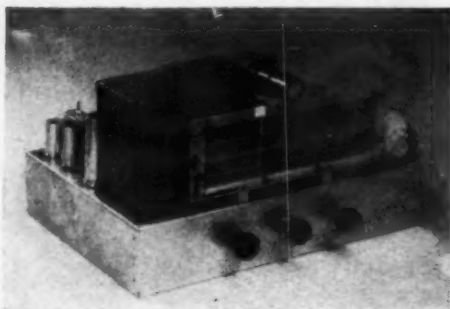
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Feedback Compression

(Continued from page 120)

result in a maximum compression of 10 db. instead of 5½ db. The resistor from the voice coil winding to the cathode of the 6SQ7 is removed.

Any compressor circuit will create distortion. This distortion should not be confused with harmonic distortion. Webster defines distortion as "to twist into an unnatural or irregular form." Although this negative feedback compressor actually reduces harmonic distortion, it nevertheless causes distortion as any other compressor circuit since it produces an unnatural condition.

Broadcast stations tolerate this condition to the extent of 2 db. average and 3 db. maximum. This amount of compression is seldom noticed by the untrained ear. Compression above this level under certain conditions can be tolerated without causing serious distortion.

Broadcast stations use compression to increase their average percentage of modulation and alleviate the possibility of overmodulation.

Compression is used in making recordings. Recording levels are governed by the difference between objectionable noise and overcutting of the groove. The use of compression here increases the average cutting level. The recording of symphonic orchestras requires higher compression levels due to the extreme variations between high and low passages.

The use of compression in home recorders increases the ability of an experienced operator to make a recording of reasonably good quality. It is not uncommon to use as much as 6 db. of compression in home recorders. The use of this amount of compression is noticeable in the recording, but results in a recording which is superior to either overcutting or undercutting. To a critical ear, this amount of compression is objectionable. On the other hand, a majority of people will not notice the distortion unless it is called to their attention.

In home recording, the compression level can be set so that a certain amount of automatic gain control is accomplished. Satisfactory recordings can be made by placing the microphone several feet from the source to be recorded and then changing this distance to a matter of inches. Such a recording procedure is not desirable; however, it is not uncommon when untrained operators make home recordings.

The amateur operator may use compression very much to his advantage. First, the compressor will alleviate the possibility of overmodulation. Second, the average percentage of modulation can be increased and third, a certain amount of automatic gain control can be accomplished with a slight amount of distortion being produced because of this action. If the operator

talks steadily, the level of distortion will be low and probably unnoticed. Slight pauses in conversation will cause the voice to become unnatural. A considerable amount of unnaturalness can be tolerated in an amateur transmitter.

The negative feedback compressor circuit can be used for expansion as well as compression by rearranging the circuit. Instead of obtaining negative voltage from the diode load resistor, positive voltage is available at the cathode resistor. By exchanging the rectifier cathode resistor for a potentiometer of approximately the same value and connecting the grid to the center of this potentiometer, the circuit becomes an expander. In conjunction with this, the cathode of the control tube should be removed from ground and connected to ground through a resistor. Another resistor should connect from cathode to "B+." The values of these resistors will require final adjustment so that the proper amount of bias is applied to the tube.

The bias adjustment of the control tube should be such that approximately 3 db. of control is maintained when the grid of the control tube is at ground potential. As the positive grid voltage is applied, the amount of feedback would be reduced producing expansion.

By a somewhat complicated switch arrangement, this circuit could be used for either expansion or compression.

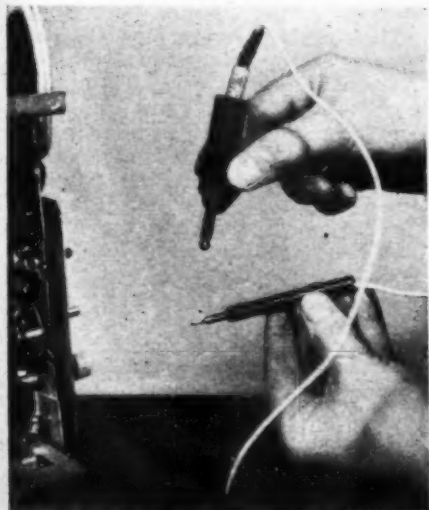
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CHECKING OPEN BYPASS CONDENSERS

THE checking for open bypass condensers may be speeded up by arranging a .01 or .05 μ fd. tubular condenser in a phone plug as shown.

The one terminal of the condenser is attached to the tip of the plug and the other terminal of the condenser is soldered to a test lead which terminates in a test prod.

With this assembly it is possible to reach almost any condenser—under the chassis and shunt the test unit across its terminals. H.L.



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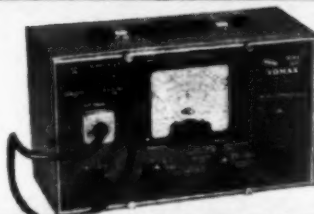
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Manufacturers' Literature

Readers are asked to write directly to the manufacturer for the literature. By mentioning RADIO NEWS, the issue and page, and enclosing the proper amount, when indicated, delay will be prevented.

QUALITY CONTROL

A 4-page folder on quality control is being offered free of charge by *North American Philips Company, Inc.* of New York.

Titled "Inspecting Incoming Material," the folder suggests procedures that may be followed from the time material arrives in a plant until it is finally accepted or rejected. The booklet also presents some requirements covering a typical inspector training course.

Those interested in receiving a copy of this folder should address their requests to *North American Philips Company, Inc.*, 100 East 42nd Street, New York 17, New York.

ELECTRIC PLANTS

D. W. Onan and Sons Inc. of Minneapolis has just issued a new 16-page catalogue covering the company's complete line of electric plants.

Electric plants ranging from 350 to 35,000 watts, a.c. in all standard voltages, frequencies, and phases, are illustrated and described in this new catalogue. To meet the requirements of users requiring direct current of the "direct service" type, a line of 115-volt models from 600 to 10,000 watts, and in 230-volt models from 3500 to 10,000 watts is also covered. Battery charging plants at 6, 12, 24, 32, and 115 volts, in sizes from 500 to 6000 watts are included.

When writing for copies of this catalogue please specify Electric Plants Catalogue, Form A-138. Requests should be addressed to Advertising Department *D. W. Onan and Sons Inc.*, Minneapolis 5, Minnesota.

ENGINEERED SOUND SYSTEMS

A new manual on the engineering and installation of sound systems has just been announced by the *Sound Products Section of Radio Corporation of America*.

Designed for use by architects, building engineers, and the construction industry generally, the new "Architects Manual of Engineered Sound Systems" is a complete guide to the installation of sound systems in industrial plants, stores, hotels, auditoriums, schools, hospitals, churches, and institutions of every kind.

The manual is divided into two parts. The first part defines and discusses the principal components of engineered sound systems and describes the engineering specifications used in installing the equipment. The second part is a work-a-day guide, including complete and detailed specifications on sound systems for the seven prin-

cipal types of buildings in which sound is most commonly used. These specifications are sufficiently complete to be used as working templates in making actual installations.

The manual, which sells for \$5.00 per copy, is available either from *RCA sound systems distributors* or direct from the *RCA Sound Products Section*, Camden, New Jersey.

TECHNICAL DATA

The Daven Company recently announced the availability of a new bulletin of technical data widely used in the design of sound equipment.

Compactly listed, the bulletin includes a table showing impedance vs. decibel loss, with values calculated for impedance mismatch, minimum "T" loss, and bridging pad loss. Also included is data on mixer circuits showing circuit diagrams and applications.

Requests for copies of this free bulletin should be made on your company letterhead. *The Daven Company* is located at 191 Central Avenue, Newark, New Jersey.

CONE AND COIL REPLACEMENTS

Waldom Electronics, Inc. is currently offering a copy of the new catalogue No. 48 covering the company's line of replacement cone assemblies and universal field coil replacements.

In addition to correlating the company's replacement part number with the model numbers of hundreds of radio receivers, the catalogue gives complete pictorial instructions on the proper cone installation, the method of ordering replacement cones, assemblies, etc.

A copy of this catalogue will be forwarded to those making their request of *Waldom Electronics, Inc.*, 911 North Larrabee Street, Chicago 10, Illinois.

TUBE PRICE LIST

A new receiving tube distributor price list, suitable for use either as a wall chart or in a price folder, has been printed by the *Tube Division of General Electric Company's Electronics Department*.

Covering 562 tube types, including many of those not in current production, the new lists are available to *General Electric* and *Ken-Rad* distributors.

Application for the new price list charts should be made to *Tube Division, Electronics Department, General Electric Company*, Schenectady, New York.

NEWARK FLYER

Hundreds of items, including p.a. systems, recording equipment, radio

and electronic parts, receivers, kits, test equipment, television, surplus items, etc. have been included in the *Bargain Flyer* just published by *Newark Electric Company, Inc.* of Chicago and New York.

The company invites hams, servicemen, dealers, and broadcast stations to write in for a copy of this new publication. Requests may be addressed to *Newark Electric Company, Inc.* at either 242 West 55th Street, New York, 19, New York, or 323 West Madison Street, Chicago 6, Illinois.

ALLIED SUPPLEMENT

Allied Radio Corp. of Chicago has recently issued a 48-page supplement listing hundreds of radio and electronic items.

Designated Special Supplement No. 114, this catalogue covers home receivers, radio-phono combinations, wire recorders, p.a. systems, ham receivers, and component parts and tubes.

The company will forward copies of this new supplement on request. Address letters to *Allied Radio Corp.*, 833 W. Jackson Blvd., Chicago 7, Illinois.

THEATER DIMMER LINE

A complete line of "Powerstat" theater dimmers for control of lighting is fully described and illustrated in Bulletin 347, just issued by *The Superior Electric Company* of Bristol, Conn.

Dimmers to handle everything from a large auditorium or theater to a store window are described and illustrated.

Copies of Bulletin 347 are available upon request to *The Superior Electric Company*, 2168 Church Street, Bristol, Conn.

TYPE "DP" BULLETIN

A completely revised Fourth Edition of the Type "DP" Bulletin has just been issued by *Cannon Electric Development Company* of Los Angeles, California.

This 24-page catalogue contains application photographs, exploded views, dimensional sketches, tabular data, insert arrangements, junction shells, and mounting hole variations for the company's "DP" line of connectors.

This bulletin should be of especial interest to the radio industry because the "DP" line has been designed primarily for rack and panel radio, electrical and electronic equipment such as transmitters, instrument panels, television camera, radar, electronic timers, etc.

Copies of the bulletin may be obtained by writing the Catalog Department, *Cannon Electric Development Company*, 3209 Humboldt Street, Los Angeles 31, California.

"PROFIT GUIDE"

The Radolek Co. of Chicago has issued a "Preview" edition of its 1948 "Radio Profit Guide" listing hundreds of items of interest to the serviceman, hobbyist, and experimenter.

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- Loss of Gain
- Oscillation
- Intermittent Operation
- Open Coils
- Weak or Shorted Tubes
- Hum and Noise

AC-DC. Ready to Operate with Instructions **\$16.50**

SEE YOUR LOCAL JOBBER
IF HE CAN'T SUPPLY YOU, WRITE US DIRECT
WRITE FOR FREE DETAILS

CONSTANT ELECTRIC
112 Cornelia St. Brooklyn 21, N. Y.

Included in this 32-page catalogue are radio tubes, transformers, condensers, volume controls, resistors, coils and chokes, servicing tools, shields and sockets, plugs, jacks, and terminals, packaged hardware, switches, shop equipment, test equipment, radio books, recording equipment, record changers, phonograph accessories and parts, sound systems, and radio receivers.

Copies of this catalogue may be obtained without charge from *The Radolek Co.*, 601 West Randolph Street, Chicago 6, Illinois.

TRANSMITTER FOLDER

Transmitter Equipment Mfg. Co., Inc. of New York have issued a folder covering their line of amateur transmitters which can be assembled from the company's unique "Temco Basic Chassis Unit."

Designed to eliminate the bugaboo of obsolescence, the company has designed sectionalized units and plug-in construction. From the 14 different chassis units, 16 different transmitters may be assembled.

This new idea in transmitter ownership is fully described in the booklet "Temco Series RA" which may be obtained by writing *Transmitter Equipment Mfg. Co., Inc.*, 345 Hudson Street, New York 14, New York.

RECORDING REPORT

The *Radio Manufacturers Association* has announced the publication of a new report "School Sound Recording and Playback Equipment" prepared jointly by the *RMA* and the *U.S. Office of Education*.

The new publication sets forth basic standards which school personnel may use in selecting equipment suitable to their needs. Copies are being provided to key school officials throughout the country, to manufacturers, and others interested in the development of sound recording techniques.

The three major methods of recording and reproducing sound are discussed in the report with recommendations for their proper use.

Single copies of this report are available without charge from either the Radio Section, *U.S. Office of Education*, Washington 25, D.C. or the *Radio Manufacturers Association*, 1317 F Street, N.W., Washington 4, D.C.

NEW MERCHANDISER

Insuline Corporation of America is now offering a new, deluxe, self-service merchandiser designed specifically to stimulate the sale of radio-electronic components.

The new merchandiser stands 70 inches high and is 34 inches wide. Constructed of wood and steel, the unit is smartly styled in blonde maple finish. The unit is designed to hold special *ICA* display cards upon which are mounted a variety of test tools, jacks, knobs, radio hardware, etc. Each side of the merchandiser holds 15 cards.

An eight page folder describing the new unit and giving details as to how

BUILD YOUR OWN

FM TUNER OR FM RADIO

FM—Condenser & Coil Kit—(88 to 108 Mc)

- Variable Condenser
- Discriminator Coil
- Oscillator Coil
- Two I.F. Coils
- Limiter Coil
- Antenna Coil
- Schematic Diagram
- Instructions

\$4.95

This Kit contains the vital parts needed to build an FM Tuner or Radio and for modernizing Pre-War FM Sets; all other parts needed are standard.

BROOKS RADIO DISTRIBUTING CORP.
80 VESEY STREET • DEPT. B • NEW YORK 7, N. Y.

this merchandiser may be obtained free of charge will be sent upon request. Write *Insuline Corporation of America*, Long Island City 1, New York.

NEW TUBE MANUAL

A new edition of the *RCA Receiving Tube Manual*, RC-15, has been announced by the *Commercial Engineering Section* of the *RCA Tube Department*.

Long used in the industry, the new manual contains a great deal of essential technical data covering the field from elementary theory to descriptions of the latest receiving tube applications. This new edition is the first since 1939.

In addition to greatly expanded coverage in its regular sections, the new edition presents many new features, the result of rapid progress in electronics during the war years. These include information on new developments in FM, up-to-the-minute technical data on miniature receiving tubes, and valuable installation and application information on the latest model television broadcast receivers.

The sections on tube and circuit theory have been expanded to 55 pages. The "Circuit Section," illustrating a wide variety of electron tube applications, has been thoroughly revised. The complete "Receiving Tube Classification Chart" has been brought up-to-date. In this quick reference chart are receiving tube types classified by cathode voltage and tube function and types with similar characteristics are grouped. In addition, miniature types are also grouped in a separate listing for easy reference to these new tube groups.

The new manual sells for \$.35 and may be obtained from any *RCA* tube distributor or direct from the *Commercial Engineering Section*, *RCA Tube Department*, Harrison, New Jersey.

RADIONIC CATALOGUE

Radionic Equipment Company of New York has prepared a 32-page catalogue supplement which is now available upon request.

Included in the catalogue are home receivers, combinations, consoles, amateur receivers and accessories, components, test equipment, transformers, television kits and parts, sound equipment, speakers, recording units, and tubes.

Copies of catalogue supplement No. 79 may be secured by writing *Radionic Equipment Company*, 170 Nassau Street, New York 7, New York.

PRINTED CIRCUIT DATA

Because of the unprecedented demand for technical information on printed electronic circuits, the *National Bureau of Standards* has just published the first comprehensive treatment of this subject in a booklet entitled "Printed Circuit Techniques" by Drs. Cleo Brunetti and R. W. Curtis.

The booklet consists of 10 chapters

SENCO-A Gold Mine of SAVINGS!

TUBES

R. M. A. GUARANTEE—
EVERY TUBE IN A CARTON

955 ACORN TUBE

Detector Amplifier Oscillator Tube—
Brand New, Each. **19c**

Type	Each	In Lots of 10 Each	Type	Each	In Lots of 10 Each
1A5GT	\$.50	\$.49	7C7	\$.44	\$.35
1S5	.69	.55	7Y4	.44	.35
1V3	.36	.30	7X7	.44	.35
1T4	.69	.55	7AF7	.44	.35
1L4	.45	.39	12A6GT	.45	.37
2A3	.55	.49	12AT6	.50	.45
2A6	.79	.69	12BA6	.50	.45
2X2	.79	.72	12BE6	.50	.45
3A4	.69	.59	12J5GT	.49	.39
308GT	.55	.50	12J7GT	.45	.39
504G	.50	.40	12K7GT	.45	.39
5W4GT	.40	.36	12K8	.45	.39
5Y3GT	.40	.33	12Q7GT	.45	.39
5Y3G	.42	.37	12SA7GT	.40	.32
5Y4G	.40	.37	12SQ7GT	.40	.32
5K4G	.40	.37	12SK7GT	.45	.35
6A7	.50	.45	12T7GT	.55	.49
6AR6GT	.49	.39	2A4	.49	.39
6AC5	.98	.92	27	.42	.37
6AC7	.63	.60	41	.40	.35
6AK5	.74	.69	42	.42	.38
6AG7 6AK7	.89	.79	43	.54	.49
6B7G	.55	.49	45	.49	.39
6C5GT	.40	.35	47	.49	.39
6C6	.45	.32	56	.49	.39
6C8	.37	.29	57	.45	.39
6D6	.45	.37	58	.45	.39
6F6GT	.45	.39	71A	.39	.29
6H6GT	.45	.39	73	.50	.39
6J5GT	.45	.39	76	.45	.39
6J7GT	.42	.38	77	.35	.27
6K6GT	.45	.39	78	.35	.27
6K7GT	.49	.39	80	.40	.38
6K7G	.50	.41	83V	.99	.89
6L6G	.79	.69	84/6Z4	.45	.36
6Q7GT	.47	.39	85	.49	.45
6S7	.59	.48	25L6GT	.49	.39
6U7G	.35	.25	25Z5	.49	.45
6V6GT	.45	.39	25Z6GT	.45	.39
6X5GT	.49	.39	35W4	.43	.40
6SA7GT	.44	.37	35Z3	.44	.35
6SJ7GT	.44	.37	35Z5GT	.43	.39
6SL7GT	.49	.47	35L6GT	.45	.39
6SN7GT	.49	.47	50L6GT	.50	.45
6SQ7GT	.44	.37	117Z3	.35	.45
6S67	.44	.39	117Z6GT	.89	.76
6ZV5G	.45	.39	50B5	.42	.32
7B7	.44	.35	32L7GT	.59	.49
7C6	.44	.35			

829 PUSH PULL Twin Beam Power
Amplifier Tube, Each. **\$1.49**

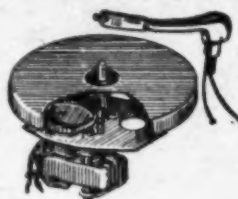
MALLORY 6 Volt 4 Prong Auto Vibrator.
Each. **\$1.19**

OUTPUT TRANSFORMERS

50L6 45c Ea. 3Q5 45c Ea. 6V6 50c Ea.
All sturdily constructed

I F TRANSFORMERS

Midget type 456 kc input output. Each. **49c**
Medium size 456 kc I F coils input output. Ea. **49c**



AC PHONO MOTOR & PICKUP

60 cycle 115 volts. **\$4.35**
Complete with
turntable

FREE Needle cup
with each
motor and pickup.

SPEAKERS

4" PM **\$1.19** 6" PM **\$1.55**
5" PM **1.15** 8" PM **2.75**
12" PM **\$5.49**
4x6 **\$1.89**

F. P. CONDENSERS

All Popular Makes Fresh Stock

15x15 mfd at 450 v.v. Each. **69c**
20x20x20 mfd at 150 v.v. Each. **69c**
10x10 mfd at 450 v.v. & 20 mfd at 25 v.v. **71c**
20x20 mfd at 450 v.v. & 20 mfd at 25 v.v. **89c**
60x60 mfd at 150 v.v. & 25 mfd at 50 v.v. **78c**
20x20 mfd at 300 v.v. & 25 mfd at 20 v.v. **82c**

OAK RECORD CHANGER

One of the most popular record changers in use today. Plays 12-10" records or 10-12" records automatically—fast change cycle. Simple, foolproof, compact 2-post—noiseless motor, feather-weight crystal pickup. **\$15.95**

VOLUME CONTROLS

250,000 ohms tapped with switch 3" shaft
500,000 ohms tapped with switch 3" shaft **44c**
1 meg ohms tapped with switch 3" shaft
2 meg ohms tapped with switch 3" shaft
500,000 ohms with switch 2 1/4" shaft. Ea. **40c**

BRAND NEW WILLARD

**\$ 20-2 2 VOLT
STORAGE BATTERY &
2 VOLT VIBRATOR**

Used in General Electric Model
#530 charge A PACK Portables.
Suitable for all Farm Radio sets.
Individually boxed.

Both for **\$3.39**

Battery alone **\$2.49**
Vibrator alone **.99**

25% Deposit with order. Balance C.O.D.,
F.O.B. N.Y.C.



SENCO RADIO INC. 96 WARREN ST
NEW YORK 7, N Y

BEckman 3-6498

PROJECTION TELEVISION

Adapt your present RCA, GE, Crosley, Philco television receiver for a 6x8 foot projected picture with the addition of a 30 KV-RF power supply and a STP4 projection lens assembly. Complete pictorial construction details of the 30 KV supply and projection system based on actual New York tavern installations described in booklet just published at \$2 each, postpaid.

PERFORMANCE RADIO CO.

289 1/2 Jerome Avenue, New York 58, N. Y.

APPLIANCE SERVICEMEN

Construct your signalling Iron Tester with **PYRON'S** thermo-electric relay, which "sounds off" when proper adjustment temperature reached. Also prevents iron overheating if forgotten Automatic. Absolutely no attention required. Price **\$6.25**. Other parts available anywhere for less than \$2.00.

Pyron Controls, 2215 Moore Ave., Anniston, Ala.

FREE BOOK

SHOWS
SHORT CUT

**CODE
SPEED**

For Amateur
or
Commercial
Radio

ENDORSED
BY CHAMPIONS

Qualify at home, in spare time, by easy, simplified system. You can learn code or gain greater speed and skill in sending and receiving by the same system that has made code champions and radio telegraph experts. **FREE BOOK OF FACTS** explains Course. It's absolutely free. Rush your name for it today.

CANDLER SYSTEM CO.

Dept. 2-A, P. O. Box 928 Denver, Colo.

SENSATIONAL SURPLUS SALE

NAVY COMPARTMENT SPEAKER AMPLIFIER UNIT

With Heavy Duty Speaker
(32 oz.). Speaker alone
worth \$25.00.

Works from
110 V. AC
DC used, but
in operating
condition.
Uses 35-Z5
rectifier and 2 35L6's in P.P. audio input
006 watts, 600 ohm imp. 5 channels
selection input. Volume
control, in grey case 14x14x
7 1/2



\$995

**MALLORY LINE
NOISE FILTER**
Rating
110-220V.
(AC DC)
\$10 Value.
Your Price

\$295

FREQUENCY METER

Directly Calibrated on large
Vernier Dial
from 80 to 300
Meg. also in-
cluded - Automatic
Switching Arrangement.

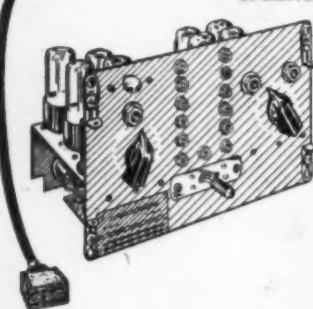
\$349

Your
Price



8 TUBE CODE PRACTICE EQUIPMENT

OPERATES ANYWHERE - BATTERIES - AC - DC



Big, Rugged, Durable 8 Tube
Amplifier in Heavy Reinforced
Trunk, Containing the Following:
• 7 Telegraph Keys with Brass
Bases, Cords and Plugs.
• 7 Western Electric Phones with
Cords, Plugs and Headbands.
• A Heavy Cable Containing 3
Jack Boxes, Cables for Battery
Operation.
• Complete Plug-ins for Instruc-
tor to Handle One or All Stu-
dents.
• Ideal for Schools - Boy Scouts,
Radio Clubs, etc.

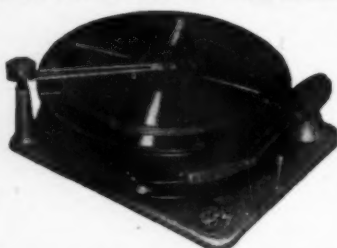
BRAND NEW
ORDER AT ONCE

\$2495

SHIPPED EXPRESS COLLECT.

MANUEL KLEIN 74 Cortlandt St., N. Y. 7, N. Y.

SENSATIONAL SELLER!



LAKE DELUXE CHANGER

Revolutionizes the Industry!
A Sensational Seller!

11 Outstanding Features:

- Positive Intermix
- Service Adjust-
ments Eliminated
- Minimizes Record
Wear
- Single Knob Control
- Plays ALL Records
- Pick-up arm may be grasped at any time and
changer will not be thrown out of adjustment
- Resonance-free ball bearing tone arm
- Easily operated—any child can do it
- Completely Jam-
proof
- Records Gently
Lowered on Spindle
—not dropped
- Automatic Shut-off
on last record

Dimensions: 13 1/2" W x 12 1/4" D x 7 1/2" H.
No. 116A. YOUR NET **\$28.73**

FREE

DEALERS and SERVICEMEN: Write for our NEW 16-
page 1948 illustrated catalog on radio parts, tubes,
accessories, cabinets, sets, electrical appliances, etc.
Get on our mailing list today!

Lake Radio Sales Co.

615 W. Randolph Street

DEPT. A

Chicago 6, Ill.

SURPLUS SAVERS

Transformers 115v.-60cy.

T16—Nat'l. known—Dual H. V. Cased 325-0-325-25 Mil. 325-0-325-25 Mil. 3 1/2 x 2 1/2 x 3 1/2	\$3.00
T18—Nat'l. known—cased 415-0-415-130 Mil. 4 x 4 1/2 x 3	3.00
T19—300v.—100 Mil. (H.W.) 22 vet.—100 Mil. 6.3-3.5 A. 2.5-10A HI-Insul. 3 1/2 x 3 1/2—Nat'l. known, Cased.....	3.00
T20—350-0-350-200 Mil. 6.3V—8A 5.0V—3A Cased—Freed-5 1/2 x 3 1/2 x 4	4.25
T7—6.3V—3A 2.5V—6.5A—HV Insul. Cased—Sealed—5 1/2 x 4 1/2 x 2 1/2	2.50
T1—315-0-315-150 Mil. 6.3V—2.1A 5.0V—3A Cased 4 1/2 x 3 1/2 x 6	1.95
425-0-425-125 Mil. 2.5V—100 MIL. Cased—Nat'l. known—4 1/2 x 4 1/2 x 3 1/2	3.25
T14—Nat'l. known—100 Watt Isolation Type Step up to 220V. or Step down to 110V. 4 1/2 x 5 1/2 x 3 1/2—Cased	2.75
T6—500 Watt Step down or Step up Auto Transformer—110-220-In 5 Taps 6 1/2 x 4 1/2 x 4 1/2	9.95
T8—#1 7.2V—22 Amp. #2 6.5V—8 Amp #3 5.0V—6 Amp #4 5.0V—7 Amp Cased—6 1/2 x 6 x 4 1/2	6.25
SPECIAL—1625's (12V. 807's) ARC-5 AMPLIFIER TUBES—New RCA In original boxes—3 for.....	1.00

25% deposit required on all C.O.D. orders.
Prompt delivery assured. Write Dept. RNJ.
Include postage with order.

GREENWICH SALES CO.

59 Cortland St. Digby 9-3813
NEW YORK CITY 7, N. Y.

totalling 43 pages and is illustrated
with application photographs and dia-
grams.

This new circular, designated NBS
Circular 468, is available from the
Superintendent of Documents, U.S.
Government Printing Office, Washing-
ton 25, D.C. The price is \$.25 which
sum must accompany the order in the
form of cash or money order. Stamps
are not acceptable.

—50—

PRINTED CIRCUIT USE

THE first commercial product utiliz-
ing the new printed electronic circuit
was recently introduced to the press.

The Allen-Howe Electronics Corpora-
tion of Peabody, Massachusetts is cur-
rently in production on a hearing aid
unit consisting of a miniature printed
circuit three-stage amplifier. With 1
millivolt input, the circuit is said to
deliver an output of 1.3 volts.

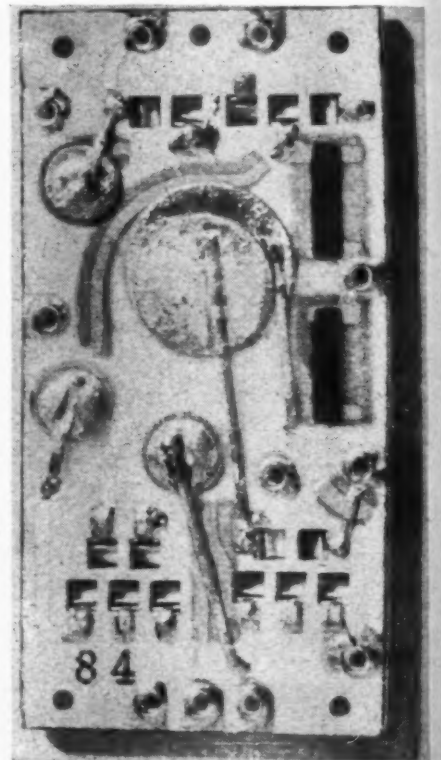
Included in the total number of
standard items the circuit eliminates
are 6 condensers, 7 resistors, 1 mounting
panel, 3 tube sockets, 1 bracket for tube
sockets, 33 pieces of wire of various
lengths, and 17 sections of insulating
tubing. In addition soldered joints and
scores of small eyelets, washers, insula-
tors, connectors, and flat machine
screws have disappeared from the
assembly.

The new hearing aid incorporates
within its case a midjet mercury cell
"A" battery for filament heating. The
new type of battery is said to furnish
power at an almost flat and constant
rate right to the point of battery
exhaustion.

The printed circuit being incorporat-
ed in the hearing aid is a product of
the Centralab Division of Globe-Union
Corporation of Milwaukee.

—51—

A 3-tube hearing aid amplifier cir-
cuit is printed on this ceramic base.



Sales Promotion

(Continued from page 45)

thing is to decide to have a policy. Here your policy will be that of promoting the fact that you know how to repair radios, and that you do an honest job. The next thing is to decide to appropriate a sum of money for that purpose. You say to yourself "I am going to spend some money advertising my business." The next thing is to find out all the different ways in which you can promote your business and how much each method costs. Then you try to figure out which method will be the best for your purpose and then you make and stick to an important resolution—to spend the necessary amount of money to accomplish your purpose.

Before we list some of the advertising devices that the radioman could use in promoting his business let us clear up one or two little items. All the rest hang on these items. One is that of the personality of a business man. His job is usually to sell something, i.e., to get people to part with money for some goods or services. People part more readily with their money if they deal with pleasant business men than with an unpleasant one. Even though you are a good workman and do an honest job, in your dealings with people be pleasant, conduct yourself so that they think of you as "the salt of the earth" type of individual and you will find it much easier to get customers and keep them.

The second little item is that of having a clean shop so that when people come to it to bring in or take out a job, they will have the feeling that here is a clean, efficient establishment in which they can have confidence and in which they would like to sit down and talk with you about their radio problems.

After these items are out of the way, what can be done to attract people to your business? Probably the oldest and cheapest advertising device is a sign. Put up a sign over your store and let people know who runs it and what is done there. But there are signs and signs. Use color that attracts attention and use letters than can be read from a considerable distance. Place the sign so that many people walking along the street or riding along the road will see it. Make widespread use of signs. Try to secure permission to place signs in other nearby locations so that many more people will see them than just those who see your store sign. Take a tip from, say, Coca Cola, or the F. & M. Schaefer Brewing Co. signs. These will cost only a few dollars apiece and may last for years.

Signs might be extended to announcements in the local telephone directory or in the classified columns of the local newspaper. Obviously this type of advertising is more suitable for a small town or country serviceman. In the large cities where the

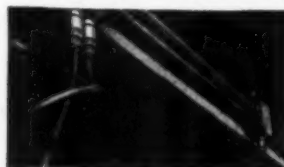
CANNON CONNECTORS —in the most amazing places!



They tap out precision through **CANNON CONNECTORS**

The high fidelity sound system of Radio City Music Hall—the world's largest theater, is connected, throughout, with Cannon Connectors. Cannon Plugs were selected for the job because they could be depended upon. They fit with precision, hold tight and are designed especially for the job expected of them.

You can say that about all Cannon Connectors. The same connector precision demanded in aircraft instruments, in radio and television circuits, in technical laboratory circuits, can be had in the circuits you use. All you have to do is specify Cannon Plugs.



CANNON ELECTRIC



Cannon Electric Development Co., Dept. A-288, Los Angeles 31, Calif. • Canadian Factory and Engineering Office: Cannon Electric Co., Ltd., Toronto, Canada • Representatives in Principal Cities . . . Consult Your Local Telephone Book

SELENIUM RECTIFIERS

FOR ALL APPLICATIONS

FULL WAVE BRIDGE TYPES

Input	Output	Current	Price
From 0-18 V.A.C.	From 0-14 V.D.C.	1 AMP.	\$2.49
0-18 V.A.C.	0-14 V.D.C.	5 AMP.	4.95
0-18 V.A.C.	0-14 V.D.C.	10 AMP.	7.95
0-18 V.A.C.	0-14 V.D.C.	15 AMP.	10.95
0-18 V.A.C.	0-14 V.D.C.	20 AMP.	13.95
0-18 V.A.C.	0-14 V.D.C.	25 AMP.	16.95
0-18 V.A.C.	0-14 V.D.C.	30 AMP.	19.95

HALF WAVE TYPES*

Input	Output	Current	Price
From 0-18 V.A.C.	From 0-7 V.D.C.	3 AMP.	\$2.25
0-18 V.A.C.	0-7 V.D.C.	5 AMP.	2.95
0-18 V.A.C.	0-7 V.D.C.	10 AMP.	4.95
0-18 V.A.C.	0-7 V.D.C.	15 AMP.	6.95
0-18 V.A.C.	0-7 V.D.C.	20 AMP.	8.95
0-18 V.A.C.	0-7 V.D.C.	25 AMP.	10.95

Input	Output	Current	Price
From 0-36 V.A.C.	From 0-28 V.D.C.	2 AMP.	\$4.95
0-36 V.A.C.	0-28 V.D.C.	3 AMP.	5.95
0-36 V.A.C.	0-28 V.D.C.	5 AMP.	7.95
0-36 V.A.C.	0-28 V.D.C.	10 AMP.	13.95
0-36 V.A.C.	0-28 V.D.C.	15 AMP.	19.95
0-36 V.A.C.	0-28 V.D.C.	20 AMP.	25.95
From 0-120 V.A.C.	From 0-100 V.D.C.	2 AMP.	14.95
0-120 V.A.C.	0-100 V.D.C.	5 AMP.	19.95

Input	Output	Current	Price
From 0-36 V.A.C.	From 0-14 V.D.C.	3 AMP.	\$2.95
0-36 V.A.C.	0-14 V.D.C.	5 AMP.	4.95
0-36 V.A.C.	0-14 V.D.C.	10 AMP.	7.95
0-36 V.A.C.	0-14 V.D.C.	15 AMP.	10.95
0-36 V.A.C.	0-14 V.D.C.	20 AMP.	13.95
0-36 V.A.C.	0-14 V.D.C.	25 AMP.	16.95

*Use with capacitor to obtain any voltage up to twice rated output.

FULL WAVE CENTER TAP

Input	Output	Current	Price
400-0-400 V.A.C.	0-350 V.D.C.	600 Mils	\$5.95

CAPACITORS

1000 MFD., 15 V.D.C.	96c
2000 MFD., 15 V.D.C.	1.69

It would be impossible to give a complete listing of all our rectifier types. Our engineering staff is at your service to help you work out the application of selenium rectifiers to your specific problems. Write us for quotations or further information on capacitors and transformers to be used in conjunction with selenium rectifiers.

25% Required on all C.O.D.s—Add 10% for Parcel Post.

OPAD GREEN COMPANY • 191 GREENWICH ST. Dept. 2
NEW YORK 7, N. Y. Phone: BEEKMAN 3-7385

CLOSING OUT ALL RADIO PARTS GOING OUT OF BUSINESS

Sprague metal encased tubular condensers 600 VDC. 1.
 \$8.49 per 100 \$69.00 per 1000
 I R C type A B wire wound cement coated
 Resistors 10 Watt, 10,000 Ohm.
 \$8.49 per 100 \$69.00 per 1000
 Jones Terminal Strip, 10 terminal.
 \$9.95 per 100 \$79.00 per 1000
 Shipping extra.

Write for circular—All prices slashed

ERIE SUPPLY CO.

88 Exchange St. Rochester, N. Y.

BC-348 RECEIVER

Complete with shock-mounting & plug \$49.00

SCOTT-SLR-F

Marine receiver 80-500 and 1.9-24 mc. 115 V 60 cy. \$89.00

5 KW GENERATORS

120 Volts single phase 60 cy. Hercules engine 4 cylinder with accessories. \$375.00

ALL ABOVE EQUIPMENT BRAND NEW

H. E. NEY

612 West 144 Street NEW YORK 31, N. Y.
 WA 6-5091

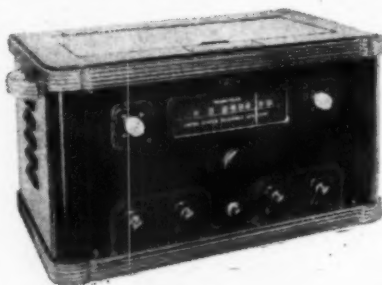
THE FIRST...and still the Best

ALL-ELECTRONIC

SWEEP GENERATOR

FOR FM • TELEVISION • RADAR

Continuous range between 500 Kc. and 110 Mc. For laboratory, school or production alignment of all wide band electronic equipment. Sweep range adjustable from 10 Mc. down to 5 Kc. at any frequency within above range. Input 110 V., 50-60 cycles, A.C., 60 watts. Two internal "markers" at 1 and 10 Mcs. Main dial marked in megacycles/sec. Attenuator will reduce output to about 30 microvolts.



Simple to operate • 1 volt max., 500 Kc. to 110 Mcs., 100 ohms, 10 Mc. Sweep Width
 • Internal 1 and 10 Mc. markers. • Covers new FM bands and commercial television channels. • Compact (14½"x8"x8")
 • Light (only 16 lbs.).

UNITED STATES TELEVISION MFG. CORP.

3 West 61st St., New York 23, N. Y.

Circle 6-4255

RADIO ★ TELEVISION ★ ELECTRONIC PRODUCTS

serviceman does a neighborhood business both directory and newspaper advertising would be too costly because of the wasted circulation. This would not be the case in a small city or town.

Here is the cost for a small city in the State of New York. The local papers, day or evening, have a daily circulation of over 21,000. This covers the city and a lot of surrounding country. A four line ad covering name, address, phone, and type of business can be run daily for six months in both papers at a cost of 36c a day. In that same community one can place a one-inch informational ad in the phone directory with over 12,000 circulation for \$8.25 a month for one year or at a cost of about 27c a day. This type of advertising has its limitations. It might be used by newcomers to a community, emergency buyers of your service, dissatisfied customers, and occasional buyers. Even so, one job a day, plus the word of mouth advertising from that job, would more than compensate for the cost.

For the radio serviceman a better method of advertising would seem to be direct advertising. This may be either by direct mail contact with prospects or by hand distribution of advertising material designed to make the necessary contact with prospects. This kind of advertising is more complicated than the above and requires that more attention be paid to it to do the job successfully. But it can be done by nearly all radio servicemen and their wives and can be extraordinarily successful in building a business of some size quickly.

Direct advertising requires the presence of three factors to make for success; one, either a definite territory marked out in which hand distribution is to take place, or use of a carefully compiled mailing list; two, something to advertise as, for example, start off with a special service offer, and follow this regularly by other offers, or advertising reminders; and three, develop the ability to write your advertising in an easy-to-read manner. Suppose you mark off an area with 3000 families or compile a mailing list of that number. You could have your offer printed on your letterhead for a few dollars. You could fold them and insert them in an envelope and either distribute by hand or by mail using 1½c stamps. The cost would be \$45.00 for stamps and about \$10.00 for printing and your own labor. A penny postcard suitably printed with the proper message at a cost of \$35.00 could also be used. Advertising reminders in the form of monthly calendar blotters could be used at a cost of not over \$60.00 by mail and something less when distributed by hand. A monthly penny postcard distribution could be used effectively. To make it interesting and sure to be read a recipe or some other important message could be printed on it below the advertising message. Various little and inexpensive advertising specialties such as pocket calendars, rulers, pencils and so on might eventually ac-

**NOW AVAILABLE FOR
IMMEDIATE DELIVERY**

The New Model

777

20,000 OHMS PER VOLT!!

SET TESTER

TUBE TESTER SPECIFICATIONS:

- Tests all tubes including 4, 5, 6, 7, 7L, Octals, Loctals, Television, Magic Eye, Thyratrons, Single Ended, Floating Filament, Mercury Vapor Rectifiers, New Miniatures, etc. Also Pilot Lights.
- Tests by the well-established emission method for tube quality, directly read on the scale of the meter.
- Tests leakages and shorts of any one element against all elements in all tubes.
- Tests both plates in rectifiers.
- Tests individual sections such as diodes, triodes, pentodes, etc., in multi-purpose tubes.
- New type line voltage adjuster.

V.O.M. SPECIFICATIONS:

- D.C. VOLTS: (At 20,000 Ohms Per Volt)
0 to 7.5/15/75/150/750/1,500 Volts
- A.C. VOLTS: (At 10,000 Ohms Per Volt)
0 to 15/30/150/300/1,500/3,000 Volts
- D.C. CURRENT:
0 to 1.5/15/150 Ma. 0 to 1.5 Amperes
- RESISTANCE:
0 to 5,000/50,000/500,000 Ohms 0 to 50 Megohms
- DECIBELS: (Based on zero decibels equals .006 Watts into a 500-Ohm line.)
—10 to + 18 db., + 10 to + 38 db., + 30 to + 58 db.

20% DEPOSIT REQUIRED ON ALL C. O. D. ORDERS



Model 777 operates on 90-120 Volts 60 cycles A.C. Housed in beautiful hand-rubbed cabinet. Complete with test leads, tubes, charts and detailed operating instructions. Size 13" x 12 1/2" x 6".

\$59⁹⁵
NET PRICE

GENERAL ELECTRONIC DISTRIBUTING CO. Dept. RN-1, 98 Park Place
New York 7, N. Y.

Electricity for Stand-by Service. Gasoline engine generating plant. PE182. Complete modern new AC power unit. 9.4 KVA at 80% power factor. Can put out 115 V., 230 V., 440 V., single or 3-phase, 60 cycle. Completely enclosed in sturdy metal housing with elaborate control panel. All mounted on a steel skid. Full instructions. Export packed, with spare parts and tools. Photo upon request... Regularly \$1800.00
OUR PRICE..... **\$699.00**

Tower TR-24. Complete w/Antenna AN-145-A. Rotary mount w/motor 115 V., 60 cycle, 1/6 HP s/Selsyn, 7 slip rings. All necessary connecting cables. Complete tripod assembly capable of holding complete array in high wind. Photo upon request..... **\$125.00**

Radar Hut—HO-18. 6 1/2 x 6 x 8 ft. Portable. Excellent for Shack. Complete with plans for 1/2 hour erection. Plywood construction. Bolts together, no nails needed. Weight approximately 600 lbs. Send for photo..... **\$69.50**

SCR 625 Mine Detector. Useful for locating metals buried in ground. Uses 1000 cycle balanced search coil. Sensitive. Contractors, plumbers, prospectors, miners all need this easy to use metal detector. Complete w/carrying case..... **\$49.95**

AN/PRS-1 Mine Detector. Similar to above except operates at 150 mc..... **\$14.95**

Scope, 5" 110 V 60 cycle input. Control unit BC 1266. 15 tubes including 5CPL. Has all power supplies built in except for 300 Volt amp. B voltage..... **\$39.50**

Indicator I-221A. Uses Selsyn with indicating rose. 100 TH Power Tubes, assorted breakers, high voltage condensers, etc. Good for antenna and transmitter control and remote modulator basic kit, 110 V 60 cycle..... **\$24.50**

SAVE EIGHT DOLLARS! Purchase both of the preceding items, packed in original shipping case and crate. Shipping weight 400 lbs..... **\$56.00**

BC 375. The famous 100-Watt Transmitter used in US Army bombers and ground stations during the war. FREQUENCY RANGE: 200 to 500 MC and 1500—12,500 MC will operate on 10 and 20-meter bands with slight modification. Self-contained modulator for carbon mike. SIZE: 21 1/2 x 23 x 9 1/4 inches. Total shipping weight 200 lbs. Complete with 4-211 and 1-10 tubes, dynamotor supply for power. Four tuning units, antenna tuning unit and the essential plugs. These units guaranteed to be in perfect condition..... **\$36.95**

GOVERNMENT SURPLUS

BC-1296 Beacon Receiver 200 to 400 KC. 2-251A, 6SK7, 6SF7, 6SA7, 6K7 tubes, included. 24-volt plate, NEW..... **\$6.95**

Whip antenna, 6 sections, 18'..... **3.50**
With insulated mounting bracket..... **6.50**

RGS-U Coax. cable, 52 ohm, per foot..... **.06**
Reel, 1200 ft..... **\$9.00**

Cable, 14-conductor, No. 15 awg stranded, 32 strands 0.01 in. dia., heavy duty rubber covered, 50' long. REP connector one end, lugs at other. Pyle National No. X-1100..... **\$3.95**

Cable, Power, 7-conductor, No. 14 ga. stranded, heavy duty, rubber covered, 65' long. Russell-Stroll, 3880, plug on each end..... **\$3.95**

Cathode Ray Tubes:
5BP4 or 5BP1..... **4.95**
12DP7 or 12GP7..... **6.95**

Nat'l Adv. Featherweight, crystal pick-ups. NEW **1.89**

Nat'l Famous hand mike, carbon, T17B with cord and plug..... **\$1.95**

Spark Plug Suppressors, 6 for..... **.35**
Box of 50..... **2.25**

Test Clips, makes contact without stripping wire..... **.20 for \$0.98**

Electrolytics, 10x10x10 @ 400 V Mallory FP Can..... **\$0.79**

Extractor Fuse Post, Holds Type, 3AG, 2 for **\$0.35**

45 V BA-26 Heavy Duty "B" Batteries, 8x4 1/2 x 7 1/2". Date of Mfg. May 1945 or later..... Carton of 4 **\$1.98**

6V Lantern Batteries, Eveready 409 and 509 or equal. 2 1/4 x 2 1/4 x 3 1/4". Date of Mfg. June 1945 or later..... Box of 30 **\$2.75**

Neon Bulbs, GE 1/4 W 115 V Bayonet Base—Box of 10..... **\$1.20**

Safety belt with strap. State belt size..... **5.75**

Lineman's pole climbers..... **4.50**

**MAY WE SEND YOU ONE OF OUR FLYERS
ON RADIO AND ELECTRONIC EQUIPMENT,
PHOTOGRAPHIC SUPPLIES AND EQUIPMENT.
TELL US YOUR WANTS.**

THE ABELL DISTRIBUTING CO.

7 E. Biddle St., Baltimore 2, Maryland

Army Portable Field Telephone EE-8 with handset, generator, ringer, etc., excellent for farms, contractors, mines, etc., requires only 2 flashlight cells. **\$12.50 ea.** 2 for **\$22.00**

SCR 522 VHF Transceiver, 100 to 156 mc. 4-crystal controlled channels. Makes a fine economical 2-meter rig, taxicab radio, aircraft set, etc. Complete with 4 crystals, 17 tubes, remote control unit, 24 VDC power supply and all connectors necessary to make an operating installation. Easy conversion to 110 AC..... **\$36.95**

SCR 522 VHF Transceiver only, with all tubes, less crystals..... **\$19.95**

SCR 274N Command Set consisting of three receivers covering (195-550 MC) (3.0-6.0 MC) (6.0-9.1 MC) and two transmitters covering (4.0-5.3 MC) (5.3-7 MC) plus all equipment including control units, racks, connectors, modulator unit and four 24 VDC Dynamotors to complete an operating installation. Each transmitter output is 400 watts. The equipment is easily converted to 110 V 60 cycle operation. **\$29.95**

BC 604 10-channel crystal controlled FM Transmitter. Push-button or manual tuning. 20 to 30 mc. Uses 1625 final. 20 watts output. 12V dynamotor. All tubes..... **\$14.95**

BC 603 10-channel, push-button or manual tuning FM Receiver. 20 to 30 mc. Superbet. BFO. 12-volt dynamotor. All tubes..... **\$14.95**

BC 191 same as BC 375 except that unit operates on 12 to 14 VDC or AC. Less tubes..... **\$12.95**

General Electric, Tungar Battery Charger, model 6RB33B2. 6 to 70 V at 6 amps DC..... **\$35.00**

Safety Switch, 3 PDT Mycalex Insulation. Enclosed type. Non-fusible. 100 amp per pole. 230 VAC. Westinghouse WK-61. New..... **\$15.95**

Rotary Beam Gear and Motor Box. Less motor, w/waterproof cover and two 3-gang waterproof receptacles. New. Original pack..... **\$8.95**

Interphone Amplifier with tubes. 1—68J7 and 1—6V6. Volume control. Dynamotor 24 V DC input. Transformer input and output, with case 7" W x 6" H x 9" D. Shockmounted. Bendix Model 3611..... **\$5.95**

Premax, 224 M, collapsible 4-section antenna. 24' extended. 6' collapsed—**\$4.95.** With insulated support, tripod mount..... **\$9.90**

New ... JUST OFF THE PRESS!

TELEVISION CATALOG

Send for
Your
COPY
TODAY!

"TELEVISION IS HERE TO STAY." If you are thinking in terms of Television—whether you own a receiver or planning to build one—get Niagara's new giant Television catalog—all in one complete and comprehensive booklet on everything for Television. Kits, Components, Test Equipment, Antennas and miscellaneous—We have them all—Make us your TELEVISION HEADQUARTERS—you will save yourself considerable time and money. Clip the coupon and mail today.

NIAGARA RADIO SUPPLY CORPORATION
160 Greenwich St., New York 6, N. Y.

TELEVISION

NIAGARA RADIO SUPPLY CORP.
160 Greenwich St., New York 6, N. Y.

Please send copy of your Television Catalog to:

Name.....

Address..... Zone.....

City..... State.....

Columbia

PUSH BACK WIRE

22 Ga. solid Push Back Wire, with cotton serve and wax cotton braid for easy push-back, available in variety of colors.

50 ft. spool—\$1.85
1000 ft. spool—3.50

INTER-COM WIRE

20 Ga. solid enameled inter-com wire, can be furnished as 2 or 3 conductor, ideal for inside or outside installation, has cotton braid over each conductor. SPECIAL FOR THIS MONTH ONLY:

500 ft. spool—2 cond.—\$ 5.95
1000 ft. spool—2 cond.—10.95
500 ft. spool—3 cond.— 8.25
1000 ft. spool—3 cond.—14.95

RUBBER REPLACEMENT PLUGS

Good quality rubber replacement plugs with brass blades, while limited quantity lasts.....100 plugs—\$4.90

ORDER FROM YOUR JOBBER—if he cannot supply you, write direct.

We carry in stock for immediate delivery many types of wire and cable in gauges of from 23 to 2, in addition to various types of multi conductor cable for many uses. We also manufacture cord sets and cables to specifications. Send us your inquiries for prompt attention.

OUR NEW CATALOG IS NOW
AVAILABLE FOR DISTRIBUTION

Write for your copy today.

COLUMBIA WIRE & SUPPLY CO.
5734 ELSTON AVE.
CHICAGO 30, ILLINOIS

REMACO BEAMS

AVAILABLE AGAIN DIRECT FROM THE FACTORY

THE
SAVE DISTRIBUTION COST UP TO 20%

We tried regular distribution for a year, but have decided we would rather deal with you fellows directly or through your jobber. This will allow us to know you better and you save the middleman's profit.

All REMACO beams are furnished complete with assembly drawings, tuning charts, and "T Match" for use with low or high impedance feed lines. Express Prepaid.

ANTENNAS NOW AVAILABLE Express Prepaid in U. S. A.

REMACO 3-10-20, (3 el. 10 to 20m) Net \$80.00
REMACO 2-10-20, (2 el. 10 to 20m) Net 54.50
REMACO 4-6-10, (4 el. 6 to 10m) Net 45.00
REMACO 3-6-10, (3 el. 6 to 10m) Net 40.00

Do you build your own?

REMACO extra heavy, Tempered (ST) Duraluminum, 3/8" and 3/4" telescoping 10m. elements. Set of 4 elements P'Paid.....\$20.00
Set of 8 REMACO clamps..... 2.00

25% with order, remainder C.O.D.

Write for new REMACO literature, or for estimates on any special form of array.

Phone B. 5486 or Wire REMACO
Write

RESEARCH MANUFACTURING CORPORATION

P. O. Box 466, Dept. N-1
SAN DIEGO 7, CALIFORNIA

company the advertising message, calling attention to it and building good-will for your business. If a device like, say, a monthly calendar is used, the cost will be \$60.00. Your list is 3000 names and the blotter is used 30 days. The cost per person per day will then be 7/100 of a cent to remind them that you are in business and ready to render them a service. The extreme in cost would be the penny postcard that reminds once and is then thrown away. The cost would be 1 1/2c for each reminder.

The penny postcard cost could be reduced and made more effective by using a Cardmaster machine for printing and a hand addressograph for addressing. You print and address your own cards in a few minutes and at a lower cost.

If the direct advertising consists of material distributed by hand, then you could develop a type of handbill that would be more flexible and permit longer advertising messages which would cost somewhat less than the advertising discussed above. In fact by the use of illustrations you might develop a handbill pattern that would distinguish your business from all others, introduce some humor, and secure better attention for your message.

The radio serviceman might also do other things that would bring in business. If you have a telephone with unlimited local service you could, in spare moments, call customers who have not been in for some time or people you know but who have never been in; others whose names have been given you by friends and customers, and finally people on your mailing or handbill list who have been introduced to you and your service by means of the direct advertising that has already been done. Even with message rate phone service this would not be too costly.

Telephone canvassing should be made an integral part of your advertising and should be done systematically. Set aside a part of each day and call a certain number of people, following a program of names as outlined above.

Prepare yourself a little beforehand for this type of canvass. Plan what you propose to say and practice how to say it. Develop what is called "the voice with a smile." A telephone personality is something different from the personality you show and which makes and keeps customers for you when you meet and talk to them. The New York Telephone Company says "be easily and accurately understood" and "make the pleasing impression that brings a pleasant response" and that is all a good telephone personality amounts to.

When you phone canvass introduce yourself immediately, and then pleasantly ask for Mr. or Mrs. ——. Explain your reason for phoning and ask in a friendly way if you can be of service.

Phone canvassing can and should be

VERIFIED SPEAKERS

"They Glorify The Tone"

WRIGHT
Inc.

2232 University Avenue

St. Paul 4, Minnesota

Fixing Radios the Old Hard Way?



The Feiler Stethoscope does everything but make the actual repair. And the Stethoscope does it faster, better and much easier. Thousands of radio men, many with little experience, are already fixing radios and other electronic equipment this new way.

You will find that just this one low priced unit and a few basic hand tools are all you need to fix practically any radio.

Here is the new Model TS-5 "Pocket Stethoscope" built to take out on the job. It's light, compact and rugged yet performs like the bench models. Stethoscopes are available in 4 types ranging from \$9.85 to \$34.95.



The "Inside Story" of the STETHOSCOPE—how it works—how it instantly locates trouble in any circuit—is yours for the asking. The "Inside Story," a 24 page illustrated booklet, is full of practical tips and hints on radio servicing. To get your free copy, send your name and address on a penny post card today.



"MAKES RADIO REPAIRS AUTOMATIC"

Available for Export—Choice Territories Still Open

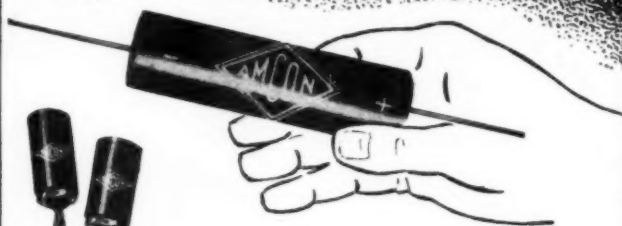
FEILER ENGINEERING COMPANY

945 George St. Dept. 1H8 Chicago 14, Illinois

Your work looks better with

AMCON PLASTIC

3 Star Performers!



Point out the Amcon Plastic Encased Capacitors the next time you return a chassis you have serviced. Your customer can see the quality of your work as well as appreciate the improved performance it has accomplished. Amcon Plastics are top-quality components that look the part—they have sales appeal as well as "engineer" appeal!

ASK YOUR JOBBER FOR THE "3 STAR PERFORMERS" CATALOG



AMERICAN CONDENSER CO.

4410 N. Ravenswood Ave., Chicago 40, Illinois

U. S. GOVERNMENT SURPLUS RADIO BARGAINS



RADIO-KIT—All Items Brand New LOOK AT WHAT IT CONTAINS

- | | |
|-----------------------------------|------------------------------|
| 6 Ft. Wire W-128 | 5 Clamp, Cord SC-A-8637-#2 |
| 2 Ea. Mast Section MS-51 | 2 Clamp, Cable SC-A-8637-#7 |
| 6 Headset HS-30 | 1 Installation, Instructions |
| 12 Insert M-300 | 2 Clamp, MC-423 |
| 1 Microphone Cover M-367 | 6 Cord CD-307-A |
| 1 Microphone T-17-B | 5 Cord CD-318 |
| 5 Interphone T-45 | 6 Cord CD-604 |
| 5 Interphone Control Box BC-606-D | 30 Ft. Wire CO-213 |
| 5 Bag of Accessories | 2 Kit of Hardware |
| | 2 Conduit Conductor |

\$12⁹⁵

F. O. B. Detroit

BEACON RECEIVERS

BC-1206-C

NEW EACH **\$4⁹⁵**
USED EACH **\$2⁹⁵**
GOOD CONDITION

8 MFD. CONDENSER

Paper—Cornell Dublier
1000-V-DC

200-V-AC New **\$1⁰⁰**

12 MFD. CONDENSERS
150 V-D.C.

\$1⁵⁰ DOZ.

PUSH PULL 6L6 OUTPUT TRANSFORMERS

20 Watts New **95¢ Each**

EAR PHONES HS 30—NEW

Complete with Transformer **99¢**

HIGH VOLTAGE TRANSFORMERS

90 V. Primary, 6400 V. Secondary, Approx. 100 Mills. NEW, EACH **\$1⁹⁵**



CO-AX CONNECTORS

M359—Right Angle Package of 10.. **79¢**

SCOTCH TAPE

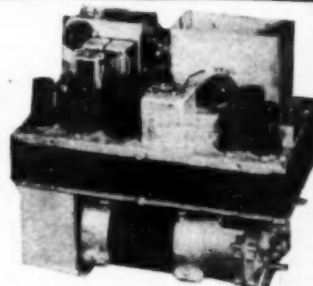
New, Fresh 3/4 inch Roll Contains 2592 inches

Per Roll **\$1⁰⁰**

I.F.F. RECEIVER AND TRANSMITTER

Complete with 14 tubes

EACH **\$5⁹⁵**



All Orders F.O.B. DETROIT, Shipped RAILWAY EXPRESS

No order under \$5.00—Please send check or money order. Orders shipped C.O.D. subject to 25% advance deposit.

RADIO CENTER

2530 E. DAVISON AVE.

DETROIT 12, MICH.

Get a new ELECTRIC SOLDERING IRON

FREE

... and assemble your own
MAGI-KLIPS
RADIO & ELECTRONIC EXPERIMENTER'S KIT



This is the same MAGI-KLIPS Kit—complete with all parts—that we sell ready assembled for \$29.75.

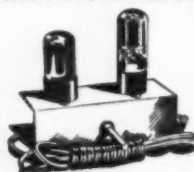
In knocked-down form with full instructions for assembly, it is now available at the low price—

\$19.75

... complete with a new Electric Soldering Iron—the ideal iron for wiring your unassembled MAGI-KLIPS Kit.

Remember, you build 18 different experiments with your MAGI-KLIPS Kit. You actually teach yourself radio and electronics and have a lot of fun at the same time.

RADIO RECEIVER, HOME BROADCASTER, PHOTO-ELECTRIC RELAY, CODE PRACTICE OSCILLATOR, SIGNAL TRACER, REMOTE CONTROL RELAY, Phonograph Transmitter, Intercommunication Amplifier, Code Transmitter, Radio Frequency Oscillator, Telephone Line Amplifier, Electronic Switch, Phonograph Amplifier, Temperature Control Relay, Contact Detector, Electronic Metronome, Interval Timer (one-shot), Interval Timer (repeating).



PHONO-AMPLIFIER KIT. A real bargain. Uses 35Z5 and 50L6. Complete diagram and instructions for assembling. Also good for call system.

Kit Form \$1.85
Wired and Tested. 2.45
Tubes for above. . . 1.65

CODE PRACTICE OSCILLATOR KIT
Learn the code! Get your ham ticket! Uses 50L6, 35Z5, 4" PM speaker. Tone and volume controls. Ideal for classroom instruction. Complete diagram and assembly instructions.

Kit Form \$2.85
Speaker and Transformer for above. . . 1.95
Tubes for above. . . 1.65
Wired and Tested, with Tubes and Speaker 6.00

Terms: 20% deposit, balance C.O.D.
Send for your copy of **FREE** booklet,
"ELECTRONICS MADE EASY"

DEER & TAYLOR COMPANY
Dept. N 1342 Milvia St. Berkeley 9, Calif.

NOW AVAILABLE! Amplifier for GE pickup



New circuits for the first time enable you to obtain full benefit from the new General Electric Model DL 1RM 6C Variable Reluctance Magnetic pickup. Employs an exclusive, humless (DC on heaters) pre-equalized pre-amplifier to produce the most satisfying musical amplifier the world has ever known. If you are a perfectionist, you are the one for whom the ACA-100GE was designed. Send for technical literature.

AMPLIFIER CORP. of AMERICA

398-2 Broadway, New York 13, N. Y.

150

supplemented by house-to-house canvassing if this seems desirable and time is available. Like phone canvassing, it should be done systematically and with proper preparation. The area to be canvassed should be carefully marked out and each day or week a certain number of calls should be made until that area has all been canvassed. The preparation should take the form of planning what to say and how to say it. Here you have the advantage of using that pleasing, helpful personality you have developed. You can also use some of your handbill advertising when using your approach to the prospect to introduce yourself, or you might work out some little inexpensive gadget such as a station roll-call or other little thing that can be used with a radio. Offer this in a nice, friendly way as compensation for the courtesy shown you in opening the door and listening to your sales talk. In every case leave something that will remind the interviewer of your business, where you are located, and what you can do for them. Prepare the housewife for your canvass by previously distributing handbills or mailing pieces and make yourself look important when calling.

In a small active community that has a local radio station the radio serviceman might make a deal for an occasional half-minute spot announcement. Once or twice a week such an announcement could be made at a cost of probably somewhere between \$5.00 and \$6.00. Tied in as it would be with radio this could be an effective piece of advertising. It would also give him a listing at the radio station that might lead to a sizable number of referrals of people who may call the station to secure a good serviceman.

The radio serviceman can tie in his

sales promotion with that of manufacturers of products used in radios and television sets. In fact, you can ask more manufacturers to do what the *International Resistance Company* of Philadelphia is doing. They are running full page, colored ads in magazines reaching radio servicemen, hams, and other enthusiasts showing the radio serviceman how he can earn more money in his field. They have prepared and distributed booklets showing servicemen how to work more efficiently, how to secure more business, and how to take advantage of IRC's radio spot announcements. These call the radio owner's attention to the need for a radio check-up by a radio serviceman. Their salesmen and distributors suggest to radio servicemen how to tie in with these spot announcements by using direct advertising material like the postcards referred to above. The postcards they prepared are hand distributed to householders who in turn can use them to request radio servicing.

Whenever you can, file your name and address with retailers who sell radios and television sets but give no repair service. Ask them to refer people to you who approach them for repairs and reconditioning services. Make it worth the retailer's while by giving him a substantial advertising specialty, such as a desk set, a diary book, etc., which continually reminds him of you and your business.

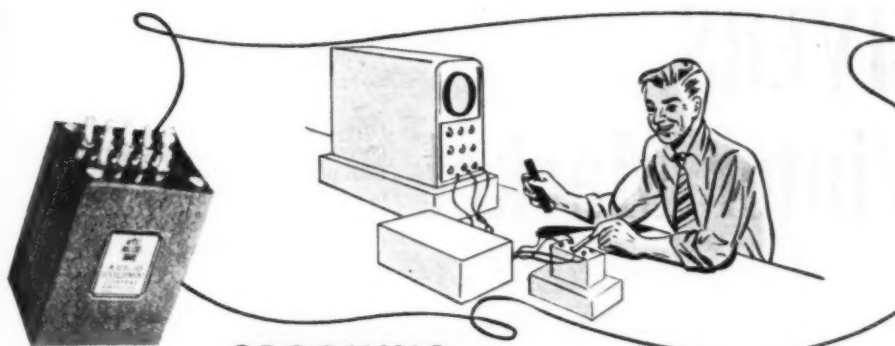
Properly done advertising brings you into contact with people who need and want your goods or services; it arouses interest in what you have to sell; it creates preference for your product, and for the radio serviceman it will even bring customers. But advertising must be used consistently and in its varied forms.

-50-

Walkie-talkie apparatus was put to good use by a London fireman in reporting and directing operations at the scene of a roaring blaze at the Limmer Wharf on the Thames River. Fire engines from all parts of London were rushed to the wharf to save bales of cotton, stores of oil, and other merchandise threatened by the blaze.



RADIO NEWS



GROOMING an

ADC AUDIO TRANSFORMER for FAULTLESS PERFORMANCE

3 Complete Tests to Meet Rigid ADC Specifications.

Strict electrical tests are given each and every ADC Audio Transformer at three different stages of production. In order to give you faultless performance on the job, every transformer must come within catalog specifications on all tests. (Custom specifications on special transformers.)

1st TEST. After assembly of coil and laminations, each component must perform within ADC specifications on frequency response, impedance ratio, phasing, breakdown and balance tests. Any unit failing to meet all requirements is rejected.

2nd TEST. After impregnation, baking and casing, each transformer is re-checked for continuity breakdown and other requirements of the particular unit. This guarantees correct wiring, perfect insulation—no "shorts" or "opens."

3rd TEST. After cleaning, labeling, etc., a final continuity, breakdown and thorough visual check is made. This quality control test—plus the finest materials and workmanship available—assures you of faultless ADC performance on the job.

Consult your jobber about ADC Audio Transformers and other Components. Ask for Catalog 46-T.

Other ADC Components: JACKS • JACK PANELS • PLUGS • PATCH CORDS



Audio Development Co.

2833-13th Avenue So., Minneapolis, Minn.

Audio Develops the Finest

All Merchandise is War Surplus and is Sold as Used — Unless Otherwise Specified



PE-103 DYNAMOTOR UNIT

Brand new. Used to power your field or mobile transmitter. Designed for use with the BC-654 transmitter and receiver. Input—6V DC 21 Amps; 12V DC 1 lamp. Output—500 V DC 16 MA. Filtered output. Hi-current relay switches, and overload protect switches self-contained in unit. Shipped in original over-sea moisture-proof container. Wt. of unit 53 lbs.

PRICE NEW.....\$8.95

SCR-274N COMMAND SET

SCR-274N Transmitter and Receiver Assembly consists of 13 pieces which are: 4 dynamotors, 1 modulator, 1 remote control box, 2 transmitters, 3 receivers and one antenna relay unit and it has its own individual dynamotor. Each receiver employs 12 V. tubes. Each transmitter contains four 12 V. tubes and has a variable frequency and crystal calibrated master oscillator, driving two 1625 final amplifier tubes, 55-watt output, with built-in silver plated variable inductance antenna matching device. Oscillator and final stage have simultaneous tuning and the dial is directly calibrated in MC. Transmitters have slugged and capacity tuning, built-in high voltage and antenna switches. Modulator furnishes plate supply for transmitters and is equipped with a dynamotor for high voltage. Also supplied is one antenna relay with built-in antenna meter. Transmitters make ideal VFO driver unit. Easily converted to 110 V. 60 cycle operation. Wt., approximately 100 lbs.

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221 FREQUENCY METER

125-20,000 Kc. with index of dial settings, metal or wooden cases in practically new condition and truly the finest that we have ever had in our store. Please do not confuse these with inferior or corrosion eaten frequency meters that are being sold in some stores. Our price is reasonable at.....

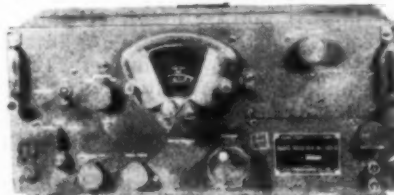
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BC-348 COMMUNICATION RECEIVER

Excellent selectivity, sensitivity and stability makes this the most outstanding of any receiver yet available from government surplus. This Receiver will give outstanding performance wherever used. Built to withstand vibration and features gear driven 100-1 ratio vernier tuning control. Six bands—500 Kc. and 1.5-18 Mc. Two stages RF, 3 stages IF, BFO, crystal filter, manual or AVC. Complete with tubes and 24 V. DC dynamotor. Easily converted to 110V AC operation. These Receivers are used, but can hardly be told from new. Guaranteed operation. Supply limited.

PRICE.....\$48.75

AC-348 COMMUNICATION RECEIVER

Power supply conversion unit for the above receiver for 110 V. AC operation. Constructed by a leading transformer company. These power supplies have gained great popularity due to quality, price and simplicity in conversion. Filament supply 24 V. Rectifier tube used: 6x5 (not included)

PRICE.....\$6.50

RS/ARN-7 RADIO COMPASS RECEIVER

Only \$31.50

Three bands 200 to 1750 K.C. Complete with 17 tubes required. This set is ideal for conversion to home broadcast Receiver, addition to ham shack, etc. Reported sold for many times the price when brand new. A Receiver that would be hard to pick up at this price. Only \$31.50



NEW RECEIVERS for Winter Market

MIDGET PHONOGRAPH

Sonata Electronics Corporation of Chicago has just announced production on the "Little Maestro," the com-



pany's midget portable amplified phonograph.

Featured is the patented "glide-out" turntable track that moves the turntable and motor at the touch of a finger, ready for instant operation. The unit plays 10" or 12" records and has an Alnico V speaker.

The unit is housed in an alligator leatherette case, with blending interior and matching hardware. The phonograph measures only 9" x 10" x 5½" and weighs just 7¼ pounds.

Additional information on the "Little Maestro" may be secured from Sonata Electronics Corporation, 624 South Michigan Avenue, Chicago 5, Illinois.

RCA AM-FM CONSOLE

Featuring 18th Century cabinet styling, the new RCA Victor radio-phono-



graph console, the Model 610V1, incorporates standard broadcast and FM radio in addition to a Victrola with

automatic record changer capable of handling up to 12 records.

The new instrument is available in either walnut or mahogany finish and has a graceful four-panel front with antique brass appointments. Centered in the two upper front panels are ring-type handles mounted against ornamental brass backgrounds. The panel on the left tilts forward to form the platform for the roll-out phonograph unit, while the right panel swings out to reveal the radio controls, including six AM push-buttons. The two lower panels have grille cloth surfaces decorated with curved brass grillework. The left lower panel provides record album storage space while the lower right panel houses a 12" electrodynamic speaker.

The RCA Victor Division of Radio Corporation of America, Camden, New Jersey is manufacturing this set.

TABLE TV UNIT

Allen B. DuMont Laboratories, Inc. recently unveiled the "Chatham," a table model television receiver with a



12" cathode-ray tube producing a picture of 75 square inches.

The new unit also includes FM reception and retails in the medium price class. The cabinet is mahogany finished and measures 23½" wide, 19½" deep and 17" high. The unit contains 27 tubes including 3 rectifier tubes, and has a 6" PM dynamic speaker.

A fly wheel sync protects reception from outside electrical interference and bandwidths are constructed to take full advantage of television transmission. The "Chatham" is equipped with a magic eye for accurate tuning, and the "Inputuner" keeps the set constantly in focus.

The Allen B. DuMont Laboratories, Inc. are located in Passaic, New Jersey.

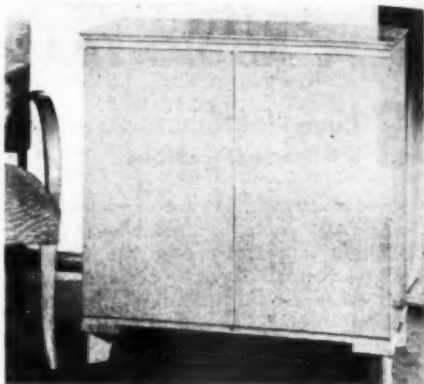
COMBINATION CONSOLE

Hoffman Radio Corp. of Los Angeles is now merchandising a new AM-FM receiver and automatic record changer unit which has been designated the Model C-510 "Bel Air."

The "Bel Air" is available in blonde or mahogany wood cabinet of modern styling with center-matched crotch doors.

Incorporating nine tubes, plus rectifier, the new console features an r.f. converter to reduce noise and improve FM performance. An exclusive Hoffman sound expansion system, push-pull power output, ten inch concert-type speaker, tone selector, and bass reinforcement are other features of this set.

A folded dipole antenna for FM and a loop antenna for AM reception are



standard equipment on the C-510. The record changer will handle twelve 10" or ten 12" records.

The company will supply additional details on request. Address letters to Hoffman Radio Corp., Los Angeles, California.

TV RECEIVER

Industrial Television, Inc. of Nutley, New Jersey is in production on a new television receiver to be known as the "Essex" teleceiver.

The new receiver has all the features of the company's previous models, including remote control and multiple units, as well as numerous new features and refinements.

The "Essex" will be offered at a lower price than previous models due to complete redesign and the use of new, more efficient components. Combining certain chassis has eliminated parts and reduced the weight of the



metal cabinet. Higher accelerating voltages for the 15" cathode-ray tube are employed, and an improved video amplifier for widest possible contrast range and definition has been included.

Among the new features of this set is a new plastic picture definer which protects the face of the tube and provides greater picture clarity through

RADIO NEWS

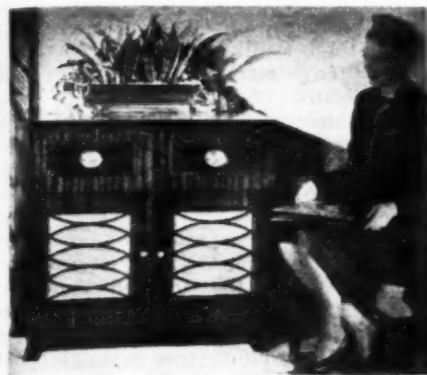
the reduction of internal reflections.

Additional details on this new public viewing receiver may be secured from *Industrial Television, Inc.*, 34 Franklin Avenue, Nutley 10, New Jersey.

CORONADO CONSOLE

The newest addition to the *Coronado* line of console radios is the "Maestro" an AM-FM radio-phonograph combination using nine tubes and a rectifier.

The receiver uses a high fidelity crystal pickup especially designed to



be used with the *Webster* record changer. A 12" electrodynamic speaker has been included for faithful reproduction.

In addition to a built-in AM antenna, the "Maestro" includes an FM antenna within the cabinet. The phonograph, capable of handling 10 and 12 inch records, is mounted in a pull-out drawer.

The *Coronado* line is distributed exclusively by the *Gamble-Skogmo, Inc.* stores.

NEW TUNER LINE

The *Meissner Division of Maguire Industries, Incorporated*, has added a new line of AM and AM-FM tuners for high fidelity reception.

The AM coverage of both units is 527 to 1620 kc. and the newly assigned channels of the FM band from 88 to 180 mc. are also covered by the AM-FM tuner.

The frequency response of these tuners is flat within ± 2 db. from 30 to 15,000 cycles. Exceptional tone control provides a 10 db. boost at 40 cycles and response variation from + 12 db. to - 14 db. at 10,000 cycles. In addition the volume control is provided with an automatic bass compen-



sation circuit to match the bass characteristics of the human ear.

Tuning adjustment is made simple by a slide rule scale and a 6U5/6G5 tube as a tuning indicator. Sensitivity

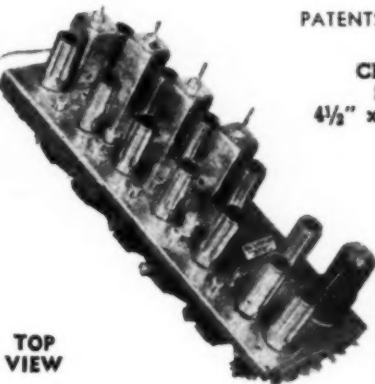
MANUFACTURERS' SERVICEMEN

This Sensational Picture IF & Sound IF Strip developed by our engineering staff and enables you to build a 10"-12" 15" - 20" Direct View or Projection Type Receiver with FM Sound Supplied with a 13 Channel RF Front End Unit

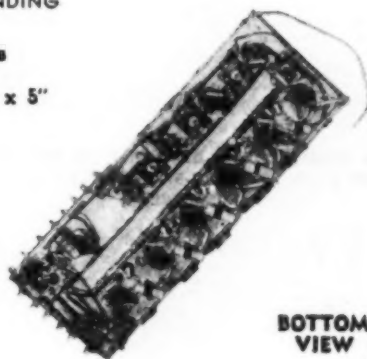
PICTURE IF & SOUND IF STRIP

PATENTS PENDING

Chassis Size
4 1/2" x 13" x 5"



TOP VIEW



BOTTOM VIEW

1. PICTURE IF STAGES

Five picture IF stages of amplification and second detector

2. SOUND IF STAGES

Two IF stages with limiter and discriminator

3. VIDEO STAGES

Two stages of Video with a frequency response of 4.5 mc/s

4. ONE D.C. RESTORER

5. IF FREQUENCY

Audio 21.25—Picture 25.75

6. TUBES

5—6J6—Picture IF Amplifier

1—6J6—Picture IF Amplifier & Detector

1—6AU6—1st Video Amplifier

1—6K6gt—2nd Video Amplifier

1—6AU6—Limiter

1—6AL5—D.C. Restorer

1—6AL5—Discriminator

2—6BA6—Sound IF Amplifier

Picture IF Band Width 4.5 mc/s

• All the Above Circuits and tubes are contained on 1 chassis. • Front End Unit on separate chassis. • Both Picture IF & Sound IF delivered completely wired, tested, tubed, and matched ready for use.

FRONT END



The Front End covers channels from 44 to 88 mc/s and 174 to 216 mc/s (13 channels). Matched antenna input for 300 ohm line.
Tubes: 1-6J6 RF Amplifier 1-6J6 Converter 1-6J6 Oscillator

PRICE **\$119.50**
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ARE YOUR SCR-274-N (or AN/ARC-5) RECEIVERS JUST A MESS OF WIRES AND PLUG TERMINALS TO YOU?

DO YOU WANT SCHEMATICS? INSTRUCTIONS? EXPLANATIONS?

Here's a 12-page folder, each page full letter-head size (8 1/2" x 11") with the answers to all your questions. Simplified schematic and explanation of the control and power circuits and all the plugs. Instructions for simple conversion of the blank adapter in front to a local-control adapter, with volume control, on-off switch, and CW-MCW switch. Schematic and parts list for A-C power pack. Complete alignment instructions for RF, IF, and BFO. Top and bottom views with 109 arrows showing parts locations. Voltage and resistance readings to aid trouble-shooting. Schematic of receiver with 3-unit rack, 3-unit control box, and adapters. Three large complete schematics, one each for BC-453-A or -B (same as R-23/ARC-5), BC-454-A or -B (same as R-21/ARC-5), and BC-455-A or -B (same as R-22/ARC-5), each schematic with coil and transformer sub-schematics, parts list, etc. This folder is invaluable, but costs you only two dollars postpaid. Include with your order.

A COMPLETE AND DIFFERENT SET FOR THE BC-946-B (R-24/ARC-5) BROADCAST-BAND RECEIVER

This set of sheets is also 12 pages, with practical wiring diagram; control-circuit explanation; A-C power pack; top and bottom views with parts-location arrows; schematic, parts list, and complete detailed step-by-step instructions which any beginner can follow to convert the set for a speaker (BFO replaced by audio driver stage), changing the R-F volume control to A-F control and adding delayed AVC; front-end adapter changeover; alignment; etc. Also two dollars.

OTHER EQUIPMENT SCHEMATICS:

SCR-274-N Transmitters, Modulator, Ant. Relay, Switch Box, and Interconnections: \$1.00.

ARB (CRV 46151), both Control Boxes, RF Alignment Chart, and Interconnections: \$1.00.

AN/ART-13A Transmitter, Control Box, Ant. Load Coil, Dynamotor, and Interconnections: \$1.00.

SCR-522 Receiver, Transmitter, Rack, Control Box, Dynamotor, and Interconnections: \$1.00.

BC-348-J, N, or Q, Plus AC Power Pack: \$1.00.

BC-348-H, K, L, or R, Plus AC Power Pack: \$1.00.

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DOW RADIO

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Pasadena Phone—SYcamore 3-1196
Los Angeles Phone—RYan 16683

is better than 10 microvolts; selectivity for AM signals may be made either broad or sharp as desired. The AM circuit will operate from any antenna with a single lead-in wire. The FM circuit is designed for an antenna having a balanced 300 ohm transmission line. Both units are provided with phono input terminals so that they may be used with record players.

Meissner Division of Maguire Industries, Incorporated, 500 W. Huron St., Chicago 10, Illinois, will supply full details on request.

Thermistors

(Continued from page 49)

than 500,000 heating and cooling cycles have effectively demonstrated the stability of their thermal characteristics.

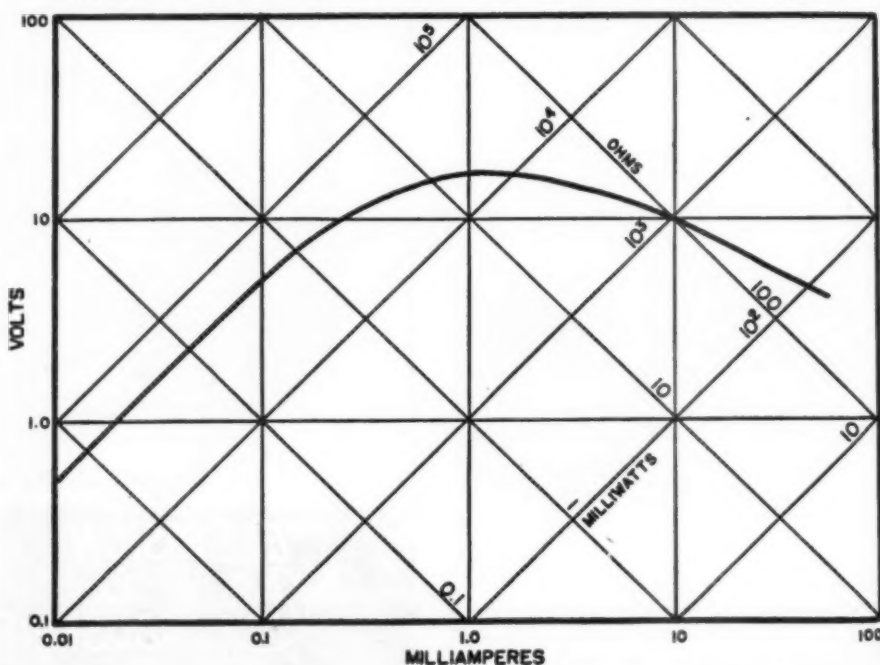
Basic circuit applications of Thermistors are divided into two broad categories depending on whether the element is controlled by ambient temperature or whether it is heated by the circuit with which it is associated. The first field includes uses such as temperature measurement, temperature compensation, and temperature control. A much larger number of applications is found in the second field in which the present and prospective uses for Thermistors grow out of various combinations of the voltage-current, resistance-power, and current-

time characteristics. One group includes flow meters, anemometers, and vacuum gauges. Another class of application utilizes Thermistors as slow actuators for relay circuits, overload protective devices, and timing mechanisms. As power responsive, variable resistance devices, Thermistors have important uses in the measurement of small amounts of power, in automatic transmission regulating networks, and in signal and characteristic shaping networks, such as speech volume limiters, compressors, or expanders. In a related type of use they may serve as oscillation amplitude stabilizers and as voltage regulators.

In temperature measurement the Thermistor is used as a resistance thermometer. The measuring current is kept so low that it produces no appreciable heating and the Thermistor resistance is dependent solely upon the ambient temperatures. Because of their high resistance compared to other measuring devices, Thermistor elements can be located remotely from their associated circuits thus permitting great flexibility in their application. Numerous industrial and meteorological applications have been developed in which temperature indications can be transmitted automatically from remote locations to control points by wire lines or radio.

As temperature compensation devices, the negative temperature coefficients of resistance of Thermistors are

A typical W.E. Thermistor exhibits a static characteristic similar to this curve relating current, voltage, resistance, and power. Current passing through a Thermistor causes a self-heating effect which is readily shown by its static voltage-current curves. At low currents, the effective change in temperature is small and Ohm's Law is obeyed, i.e., the current is proportional to voltage and the characteristic is a straight line. With increasing current the effects of self-heating become evident and the temperature of the Thermistor rises with a resultant decrease in its resistance, thus, as the current increases, the points for the steady-value voltage deviate more and more from a straight line. At some particular current, the voltage attains a maximum value and for larger currents, the voltage actually decreases. At still greater currents, the voltage becomes of the same order as the voltage drop in the connecting leads and thereafter the voltage increases. Voltage and current range can be greatly extended by proper design. This voltage-current characteristic is of fundamental importance in the application of Thermistors to a great variety of voltage regulating networks.



used to offset the positive coefficients of resistance usually encountered in electrical circuits and components.

Temperature control by Thermistors is an obvious corollary to their use as temperature measuring and compensating devices. The principles of application are essentially the same except for the method of utilizing the changes of resistance to provide means of control. A Thermistor inserted in a simple relay circuit will automatically govern the rate of flow of a cooling medium as in regulation of air conditioning, heating, or refrigeration systems, wherein Thermistors can be made to respond to very minute changes in the surrounding element, thereby substantially reducing the size and complexity of their associated equipment, materially lowering operating costs.

Their time-current characteristics find numerous time-delay applications. The gradual lowering of resistance which results when a Thermistor is self or directly heated by the current passing through it, can be employed to delay the operation of a relay or any other electrically operated mechanical component. This same principle may also be used to prevent false operation of relays or other devices caused by transient voltages. They may be designed so that their thermal inertia, together with their high initial resistance, discriminate against high voltage surges of short duration. Closely allied to surge suppression is the application of Thermistors as overload protectors; one being inserted in the output circuit can provide the desired overload protection.

Thermistors may also be used to stabilize the output voltage in circuits in which the input voltage varies over a considerable range. The principle finds useful application in the voltage regulation of both a.c. and d.c. power supplies; it has definite advantages over conventional voltage regulator circuits using constant voltage transformers or cold cathode tubes, provides better regulation and substantially negligible distortion and is independent of the power supply frequency. Thermistors used as volume limiters in speech and other circuits utilize the same basic principles as in voltage regulation. Variations of the volume limiter also can be used for audio-frequency signal compression or expansion purposes.

The foregoing synopsis of basic control circuits affords ample evidence that the Thermistor, as a control element, is adaptable to almost every kind of industrial electronic requirement, there being little doubt that these and many other as yet unconceived uses for this "new tool" will ultimately emerge in response to industry's requirements.

Today the Thermistor is ready to play its biggest role in helping the industrial development engineer pave the way toward the electronic world of tomorrow.

-50-

January, 1948

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1000 Ohms, DC. Reg.
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50 paper tubular condensers. Values from .002 mfd. to .1 mfd., 400 v.d.c. to 600 v.d.c.
Regular Price \$5.00
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Buy 1 for **\$1.45** and save 35c
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Famous Make SOLDERING IRON
55 watts 110/120 volts. Reg. price \$2.50
Buy 1 for **\$1.90** and save 60c
Buy 2 for **\$3.60** and save \$1.40
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PROGRESSIVE RADIO TOOL KIT
A Progressive Electronics Special. Contains 55 watt 110/120 volt soldering iron, radioman's combination long-nose pliers and cutters, amber handle screw driver, Polystyrene alignment tool. Reg. price \$4.95.
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Rehearse the FCC license examinations Practice the procedure Practice the multiple-choice examination methods used by FCC Check your knowledge Locate your weak points Correct your weak points before taking the actual examination

Prepared by Arthur R. Nilson, Famous Co-author of Nilson and Hornung's RADIO OPERATING QUESTIONS AND ANSWERS
Cleveland Institute of Radio Electronics, RN-1 Terminal Tower, Cleveland 13, Ohio

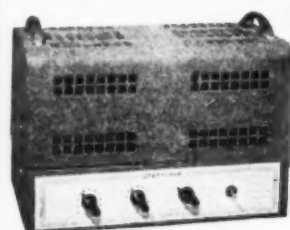
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Address.....
City..... Zone..... State.....

135

HOBCO JANUARY SPECIALS

BRENTWOOD AMPLIFIER



Model K 14
14 Watts

\$26⁹⁵

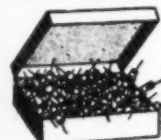
Features 2 separate high impedance inputs for phono and microphone, separate gain controls for mixing and fading, tone control, push-pull beam

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TRANSMITTING KEY

Brass nickel plated, silver contacts, switch. Binding posts on bakelite base. Reg. \$5 value.

60c



100 Assorted 1/2-Watt
Carbon Resistors **\$1.50**
Color Coded

500,000 Ohm Volume Control with Switch... **\$4.55**

Speaker Cold Patch Kit—mend your own speaker cone... **.75**

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New Rotary Beam

(Continued from page 44)

mounting made by the *Workshop Associates*, but any similar ones, home-made or otherwise, will, of course, be satisfactory. The boom for the antenna is made of 1" steel tube, as is the supporting upright, and referral to the sketch will show how 1" pipe "T's" are used to mount the boom, as well as the elements themselves, thus resulting in a strong light structure without the bother and expense of welding, etc. Everything is secured with No. 8 1/2-inch metal screws, and the whole thing can easily be made and erected by one man in a single day.

Feed systems tried included 50 and 70 ohm coaxial cable, and both 75 and 300 ohm *Amphenol* line, with just about equal results. The best performance, from the standpoint of simplicity and ease, was achieved by Kilowatt *Amphenol* 75 ohm line, tapped directly onto the final tank of the author's 75 watt rig. While all the feed methods result in mismatch, it apparently has no net effect on the effective performance of the system. The given impedance of a W8JK-Beam is about twenty-three ohms, and the addition of parasitics will of course lower this, but from a practical angle, the 75 ohm line, when tuned of course, with series condensers at the rig, works beautifully.

For a beam of sixteen feet elevation, with very good front-to-back ratio, with low vertical radiation, and featuring the ease of installation, manufacture, adjustment, and feed that the system offers, this new approach to antenna design will be the answer to many of the low-power (r.f. and pock-

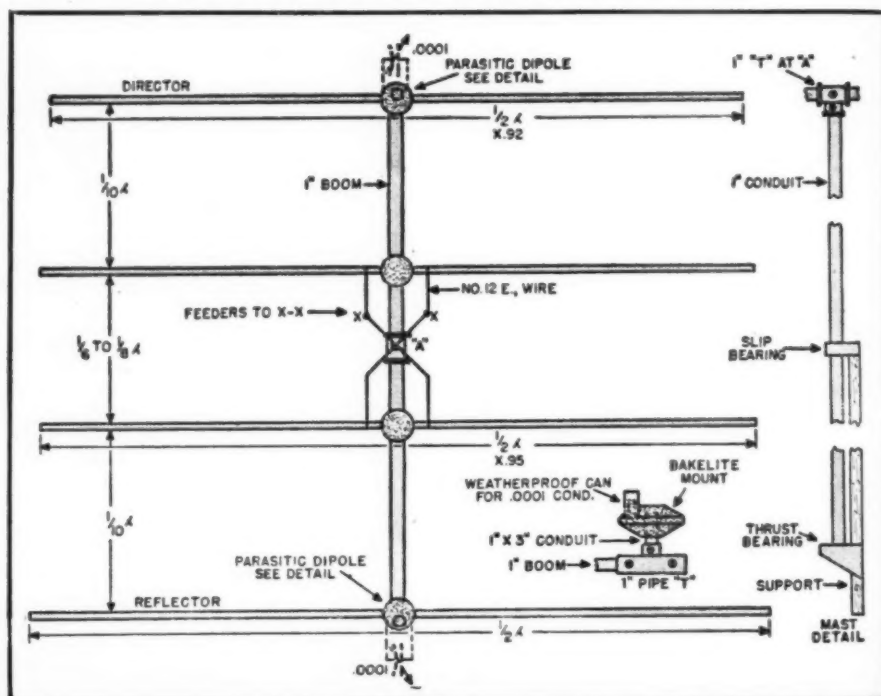
etbook, both!) hams of the 10-m. gang.

Data in full on the W8JK section proper is widely available in handbooks, etc., so no detail need be given on it here. The parasitic elements, when condenser tuned, change physical length considerably from accepted formula. The best bet is to make the reflector about six inches longer than normal, and tune it to the right length with the shortening property of the condenser. The director was made about four inches longer than normal, and shortened in a similar manner.

The photograph and drawings will give an idea of the author's method of mounting and protecting the condensers, a method made ideal by the use of the *Workshop Associates* dipoles and mounts, but ingenuity and circumstance will, in most cases, dictate this. The protecting covers, incidentally, are the small ten-cent size baking powder cans! They are very light, inexpensive, easily obtained, and are ideal for the purpose. When installation is complete, they can be made waterproof by running a thin bead of solder around the juncture of lid and can.

All in all, this antenna has exhibited about the most satisfactory performance, everything considered, of any we have yet seen or used, and the author highly recommends it to anyone in search of an answer to "poor man's DX." A lean pocketbook, limited facilities and low power can all be whipped with it, as the reports from Europe, Asia, Canada, South America, etc., indicate. Given good conditions and a decent location, a reasonably clear of QRM frequency (if you find one, let me know!!) and intelligent use, it will make WAC for many of the boys in the 50-100 watt classification at a minimum of expense. —50—

Diagram shows mechanical assembly of rotary beam antenna.



What's New in Radio

(Continued from page 80)

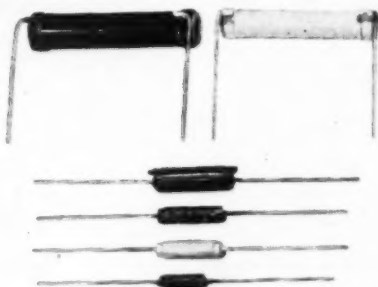
amplifier stage, an audio output stage and a b.f.o. coupled to the second detector to provide c.w. reception. A crystal filter is connected between the first detector and the first i.f. stage and a voltage regulator tube is used to regulate the plate supply to the high frequency oscillator tube.

National Company Inc., Malden, Massachusetts, will forward a catalogue sheet on this receiver to those requesting it.

R.F. PLATE CHOKES

To meet the requirements of high frequency equipment, Ohmite Manufacturing Company of Chicago has developed six new r.f. chokes.

The recommended operating ranges are as follows: Stock No. Z-14, 7 to 35 mc.; Z-28, 20 to 60 mc.; Z-50, 35 to 110 mc.; Z-144, 75 to 190 mc.; Z-235, 160 to 350 mc.; and Z-460, 320 to 520 mc. The first two units are rated at 1000 ma.

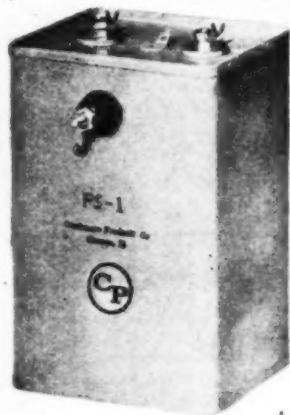


These new chokes are single layer wound on low power factor steatite or molded plastic cores and are covered with a moisture-proof coating which protects the wire and holds each turn firmly in place. The units are mounted by means of their 1½" tinned copper wire leads.

This new line is described in Bulletin 133 which is available from Ohmite Manufacturing Company, 4954 Flournoy Street, Chicago, Illinois.

POWER SUPPLIES

Condenser Products Company of Chicago has recently introduced a new line of hermetically-sealed high voltage, low current d.c. power supplies.



The company is currently in production on the "HiVolt" PS-1 and PS-2 supplies, both of which transform 118 volts a.c., 60-cycles to 2400 volts d.c. The PS-1 is designed to charge Plasticon condensers for use in electronic photoflash and spectrographic analysis equipment. The

counters, oscilloscopes, and television receivers.

A specification sheet covering these units may be obtained by writing Condenser Products Company, 1375 N. Branch Street, Chicago 22, Illinois.

AUDIO OSCILLATOR

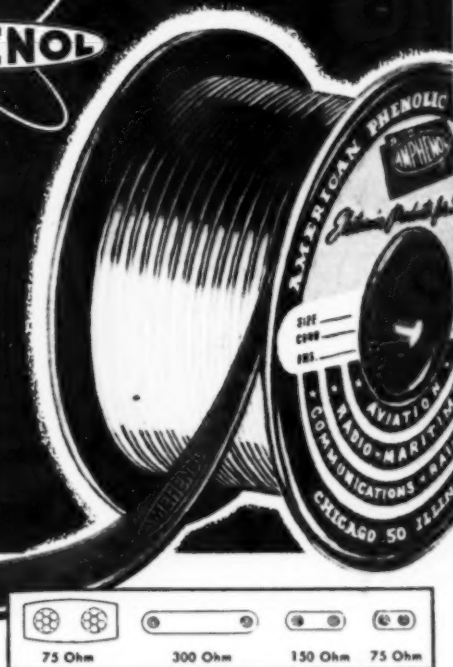
The Model 200 audio oscillator, recently developed by Barker & Williamson, Inc., consists of a modified Wien Bridge RC oscillator and a two-stage inverse feedback output amplifier with self-contained power supply. This

January, 1948

Assure low-loss FM and television antenna installations



GENUINE
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TRADE MARK



TWIN-LEAD TRANSMISSION LINE AND ACCESSORIES

• Expert electronic technicians quickly recognized the excellence of Amphenol Twin-Lead and accessories for FM and television lead-ins.

Designed to transmit signals with minimum loss, Twin-Lead is durable, simple to install and inexpensive. It is full thickness edge to edge, and is available in four impedances: 300, 150 and 75 ohm for lead-ins; and in a 75 ohm impedance for transmitting.

Amphenol Twin-Lead holds noise pickup to a low level, and insures uniform impedance so important in eliminating ghosts in the reception of television. It also simplifies matching antenna and transmission line.



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CONDUIT • ANTENNAS • RADIO COMPONENTS • PLASTICS FOR ELECTRONICS

157

WAR SURPLUS

**BRAND NEW
COMPONENTS FROM FORMERLY SECRET
SPERRY "AUTO PILOT"**



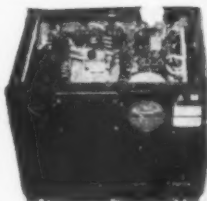
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**AMPLIFIER
RACK
WITH RELAYS
AND METERS**
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\$695**



Consists of magnesium cabinet that mounts

- 7 DPDT Allied Relays • 1 SPST Relay
- 1 Weston 0-125 AC Volt Meter
- 1 350 to 450-cycle Frequency Meter
- 1 115-volt, 400-cyc. Transformer
- And many other parts

This unit is of special interest to "hams"! The cabinet would be excellent for small transmitters or receivers. 12 1/2 x 14 x 10"; 23 lbs.

You pay shipping costs. Send check or money order to

SURPLEX RETAIL SALES INC.

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Dept. RN-1 Phone CALumet 9130

Gasoline driven 110v. 60 Cycle AC Generators. You'll never see another bargain like this. 2500 Watts, 115 v. 60 cycle, New \$250. Slightly used \$200. Briggs and Stratton Engines, 1000 Watts, 115 v. 60 cycle, New \$175. Briggs and Stratton Engines.

600 Watts, 115 v. 60 cycle, New \$85. Slightly used, \$50.00. Wisconsin Engine. Trylon steel ladder towers, 50 foot, new, complete with mounting base guy wire and insulators, hardware, wrenches, rope (320 ft.) gin pole and instructions, everything but the labor \$100.00 each. Four \$75.00 each. In 3 wood boxes, 550 lbs.

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**VAN NORMAN
Radio Supply Co.**

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ELECTRONIC VOLT-OHMMETER

\$1185 110 VOLTS AC 20 RANGES
0.5-10/50/100/500/1000/5000 volts
DC and AC 0-1,000,000,000 ohms in
six overlapping ranges. Sensitivity:
over MILLION OHMS per VOLT on 5
volt range.

Complete kit, panel, chassis, nine inch long dial scale, tubes, components. Cost is low because special slideback circuit eliminates need of expensive meter.

STERLING ELECTRONIC COMPANY
BOWLING GREEN, DEPT. 4, KENTUCKY

new instrument is designed for distortion or frequency measurements, or for any application where a stable, accurately calibrated source of frequencies between 30 and 30,000 cycles is required. No zero reset or line calibration is necessary with this instrument.

The unit measures 13 3/4" x 7 1/4" x 9 1/2" and weighs only 12 pounds.

A bulletin describing this new test instrument is available from *Barker & Williamson, Inc.*, 237 Fairfield Avenue, Upper Darby, Pennsylvania.

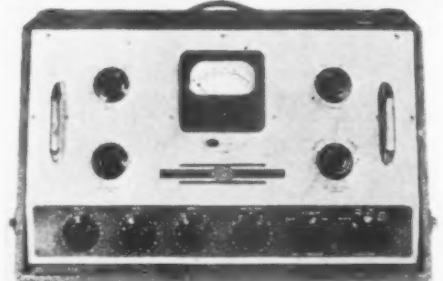
RECORDING AMPLIFIER

The new *Presto 90-A* recording amplifier is a portable console containing all the facilities necessary for operation on remote assignments, but with an over-all performance usually found only in high fidelity studio equipment, according to the manufacturer, *Presto Recording Corporation* of New York.

The 90-A consists of three preamplifiers, mixer, master gain control, and recording amplifier. The selector switch provides a flat response, 30 to 15,000 c.p.s. ± 1 db., the NAB 33 1/3 r.p.m. recording and playback characteristic complementing the NAB recording, and the present day 78 r.p.m. recording characteristic. The flat response can be modified by variable bass and

treble controls giving emphasis up to 20 db. at 100 and 7500 c.p.s. or 20 db. de-emphasis at 7200 c.p.s.

A data sheet giving characteristics on the 90-A is available upon request



to *Presto Recording Corporation*, 242 West 55th Street, New York 19, N. Y.

FM-AM SIGNAL GENERATOR

The *Triplett Electrical Instrument Co.* has announced the availability of a new FM-AM signal generator, the Model 3433.

This new unit covers a frequency range from 100 kc. to 120 mc. in ten fundamental bands, plus an additional 50 mc. from a fixed oscillator which provides fundamental coverage to 170 mc.

Unique features of this unit include constant deviation by using fixed fre-

IMPORTANT SERVICE MEET

ALL branches of the radio industry will join in sponsoring the three-day "Town Meeting of Electronic Technicians" being held in Philadelphia, January 11, 12, and 13.

Designed to assist the radio technician, this meet is a joint undertaking of the Radio Manufacturers' Association, the Sales Managers Club, Philadelphia members of the National Electronic Distributors Association, the Electronic Parts and Equipment Manufacturers, and the Mid-Lantic Chapter, The Representatives, with the assistance and cooperation of the Federation of Radio Servicemen's Associations of Pennsylvania and the Philadelphia Radio Servicemen's Association.

Format of the meeting, which will be held in the Bellevue-Stratford Hotel, will provide radio technicians of that area with latest electronic technical information and with expert advice on

various phases of small business management.

The Philadelphia program is in charge of Harry A. Ehle, chairman of the Coordinating Committee's subcommittee on the Town Meeting of Radio Technicians.

The program will open with a keynoting session on Sunday night, January 11th. All-day sessions Monday and Tuesday are calculated to give the technician the latest information on management and technical subjects designed to be most useful to him in his own shop. Extensive coverage of television and FM has been included to furnish the basic information necessary to the serviceman.

The program was developed on the basis of questionnaires circulated among technicians in the Philadelphia district.

-30-

TV CABLE SERVICE STILL FREE—A. T. & T.

THE American Telephone and Telegraph Company has called our attention to a statement appearing in the article "Networks for Television" by Jordan McQuay (November, 1947 issue) which is incorrect.

The article states, on page 41, that "Now, however, these facilities are available only on a commercial basis! Recent publications of the tariffs created a near-panic in the television industry. The charges averaged better than \$40 per circuit mile of cable linking New York, Philadelphia, Baltimore, and Washington."

It was pointed out that A. T. & T. asked the Federal Communications Commission last summer for permission to withdraw tariffs previously filed

covering rates for intercity television transmission, and this permission was granted. The Commission was also requested to approve withdrawal of the proposed rates without prejudice to the subsequent filing of tariffs for this service by the company.

The company stated that it was requesting withdrawal of the proposed tariffs to permit further studies of the technical problems. Present experimental television service over the New York-Washington coaxial cable, which has been given by the company without charge to the television industry, will be continued until final tariffs are filed. No definite plans have been made, as yet, for filing such tariff schedules.

-30-

quency reactance modulated oscillator; output meter for measuring relative r.f. output; double copper-plated steel shielding to minimize r.f. leakage; coaxial cable output lead; ladder attenuator; high r.f. voltage output jack; high a.f. output available; air



trimmer condenser and permeability adjusted oscillator coils; voltage regulated power supply; heterodyne detector; and external AM modulation.

Additional information on the new Model 3433 may be secured by writing The Triplett Electrical Instrument Co., Bluffton, Ohio.

MULTI-PURPOSE MICROPHONES

Electro-Voice, Inc., of Buchanan, Michigan, has announced production on the new multi-purpose "Century" series of microphones for low-cost public address, paging, recording, and communications applications.

The line is available in a choice of crystal, dynamic, or carbon types. The microphones can be used in any position, on table or desk, mounted in the new Model 415 reclining desk stand, hand held, mounted on a floor or desk stand, overhead suspension, or dash mounted by means of a convenient hook for mobile applications.

The Century Model 915 crystal microphone has an output of -50 db. and a frequency response of 60 to 7500 c.p.s. The unit is housed in a metal case which provides ample shielding and stability.

The high impedance dynamic micro-



phone in the line has a -57 db. output and frequency response of 55 to 7500 c.p.s.

The single button carbon microphone is designed to provide speech

January, 1948

MANUFACTURERS CLEARANCE

ONLY 500 LEFT

Immediate Delivery!



Model PH25

ONLY

25 WATT
HIGH FIDELITY
PUBLIC ADDRESS
SYSTEMS

\$29⁹⁵

INCLUDING TUBES
LIST PRICE \$100.00

SPECIFICATIONS

TUBES—2—6SC7, 2—6L6, 1—5U4G, 1—6N7.

CHANNELS (3) — 2—Mic High Gain 125DB, 1—Phono 87DB.

RESPONSE — 40-12000 cycles plus or minus 7 DB.

OUTPUT IMP. — 2-4-8-15-500 ohms at both "Speaker Terminals." Strip or sockets. Handles 2 microphones.

OUTPUT POWER—25 Watts 3% dist. 35 Watts peak. Hum level 57DB below output.

DUTY — Continuous—PROTECTION—Fused 2 amp. slow blow.

CASE—Steel two-tone black and silver crackle. Blue panel White letters.

CAPACITORS—Oil coupling condensers and hermetically sealed electrolytic filter condensers.

SOCKETS—Output and rectifier sockets statite.

DIMENSION—8 $\frac{3}{4}$ x 10 x 14 $\frac{1}{2}$ inches.

POWER INPUT—110-125 Volts 60 cycles.



Manufactured and
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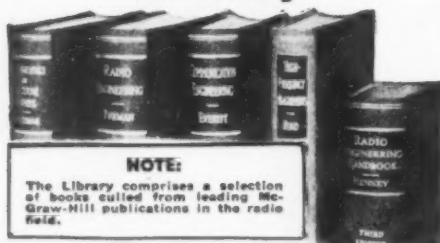
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Hi-Flex in our opinion has incorporated every worth while improvement known to the industry to date. Has seven strands of No. 31 special "Spemco" tinned alloy. All Rubber Insulation. Approximately 25 MMF. O.D. .250. It is especially constructed and will not break down when subjected to hard usage. This cable will deliver consistently uniform response, regardless of climatic conditions.

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response (200 to 4000 c.p.s. with 48" cable) with highest articulation. The output level is 22 db. below 6 mw. for 10 dynes/cm².

Complete information on the new Century series is given in Bulletin No. 137 which will be forwarded upon request to *Electro-Voice, Inc.*, Buchanan, Michigan.

PHENOLIC TUBULARS

Climaxing four years of intensive research, *Sprague Electric Company*

of North Adams, Massachusetts has just announced a complete line of phenolic-molded paper tubular condensers.

Features of this new line include high heat and moisture resistance, non-inflammable, and conservative operation rating for from -40 degrees C to + 85 degrees C.

In most instances the new molded tubulars are smaller, and in no instance, are they larger than ordinary *Sprague* paper tubular condensers of

SUPER CONSOLE MAKES BOW AT LONDON SHOW

DURING the recent Radiolympia exhibition held in London, a super-sized console radio-phonograph, the "His Master's Voice" Model 1700, brought in over one hundred orders during the ten days the show was open.

The instrument is a 43-tube type, all-world radio receiver and record player housed in three large consoles and incorporating a remote control pedestal. One console houses the radio receiver and time switching apparatus, a second console contains the loud-speaker assembly, power units, and l.f. power amplifier, while the third cabinet houses the record playing mechanism, pickup amplifier, and storage space for records. In addition, a remote control pedestal, finished in polished walnut to match the console, can be situated some distance away, and the instrument operated thereby.

The radio unit provides reception from 10-2000 meters. A separate FM receiver covers the FM band from 90-94 mc. All the controls (with the exception of a few that are preset and require very infrequent adjustment) are mounted on the control panel under the lid or on the front. Some of these are duplicated on the remote control pedestal. The 12 waveband radio receiver has three i.f. stages, and signal frequency amplification on all ranges.

The center console houses four loud-speakers, the l.f. power amplifier, and the power supply units. The loud-speakers consist of two large and one

medium high flux permanent magnet elliptical types, and one high frequency ribbon-driven horn speaker. A frequency dividing network distributes the appropriate frequencies to the speakers concerned and the over-all response of the system is remarkably linear over the audio frequency range. The output stage consists of four KT66 tubes operating as triodes in parallel push-pull giving a peak output of 50 watts. The other chassis housed in this console is the power supply unit containing three U52 rectifiers and appropriate smoothing circuits.

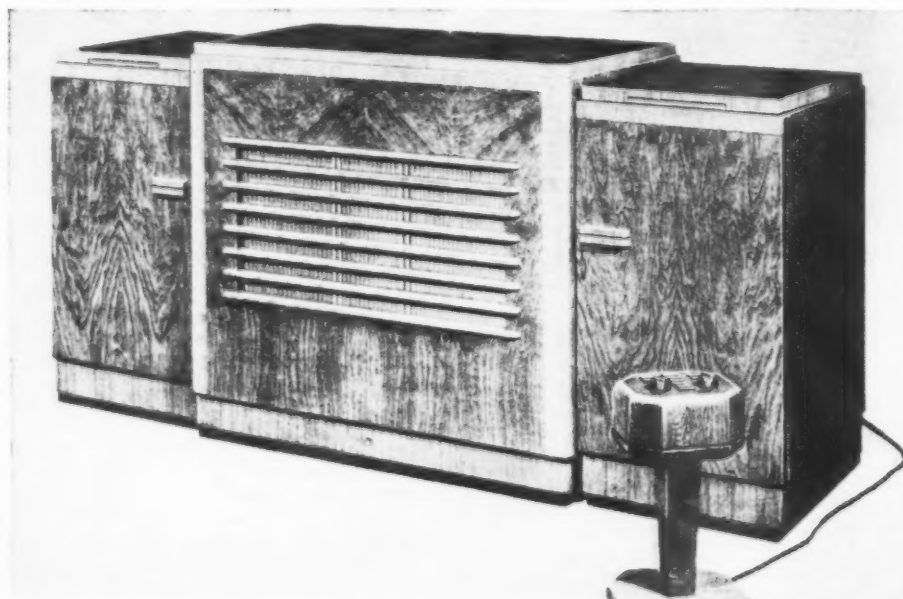
The record playing mechanism and pickup amplifier are housed in the third cabinet, the lower part of which may be used to store records. The record changer is of new design and handles ten 10" or 12" records intermixed. Records may be rejected or repeated as desired. A lightweight cantilever pickup with permanent sapphire needle provides wide frequency response and is completely free from resonances over the whole audio range, according to the manufacturer.

The remote control pedestal, which is connected by a length of cable to the radio unit, is put into operation by the local/remote switch. Remote operation of the radio and phonograph unit is then possible.

This unit is being retailed at 550 guineas. The guinea is worth about \$4.20 in U.S. currency at the present rate of exchange.

-30-

British-made "His Master's Voice" Model 1700 FM-AM-SW radio-phonograph combination.



equal rating. Their unique phenolic sealed construction assures maximum dependability under extremes of heat, humidity, and physical stress, according to the company.

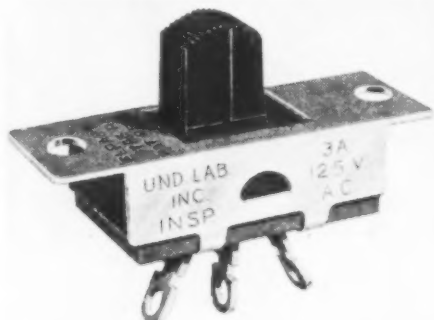
Available types include all popular capacities in 200, 400, 600, 1000, and 1600 volt types.

Sprague Engineering Bulletin 210 contains complete information on this new line. A copy of the bulletin may be secured from *Sprague Electric Company*, North Adams, Massachusetts.

SNAP ACTION SLIDE SWITCH

A new, Underwriters' Approved snap action slide switch has recently been introduced to the trade by *Elpar Company* of Camden, New Jersey.

Known as the Type RE, the new switch is rated at 3 amps, 125 volts a.c. Both s.p.s.t. and s.p.d.t. action is available. The unit is self-actuating beyond the center of the throw and is especially suited for mechanical op-



eration. The effective throw is .140" and the maximum travel is .160".

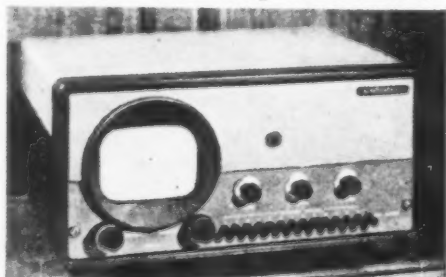
Over-all dimensions of the switch are 1.375" long, .550" wide, and .700" deep, excluding the knob. The two mounting holes are .136" in diameter with mounting centers 1.125".

A shield and insulating cover provide for terminal protection and efficient grounding.

Full details on these switches may be obtained by writing *Elpar Company*, Bank and Marlton Avenues, Camden, New Jersey.

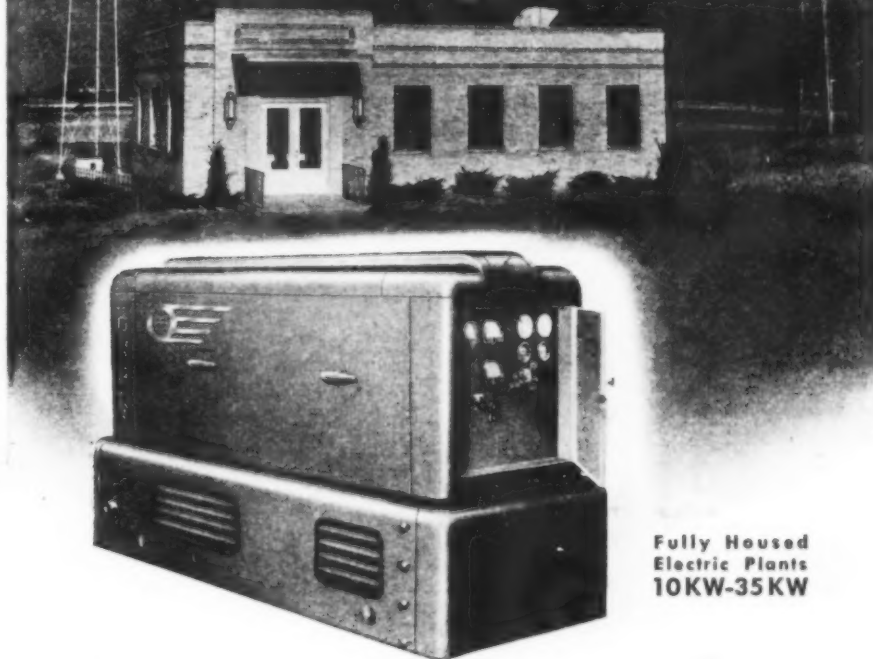
-30-

Hallicrafters' new table model television receiver which has been designed to sell in the low-priced class. The new unit uses 22 tubes and provides 13 channel push-button selectivity. The receiver housed in a metal cabinet, finished in gray and silver, was designed by Raymond Loewy. It is equipped to accommodate a detachable lens accessory to bring larger images. This self-contained TV receiver features a 23 sq. in. image, push-button for fine tuning, simplified volume control, horizontal and vertical image adjustment by means of dials.



January, 1948

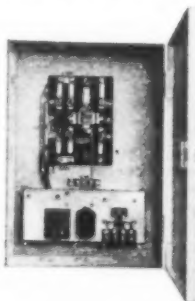
ONAN Electric Plant Assures Station WING of Uninterrupted Power



Fully Housed Electric Plants 10KW-35KW

Storms, floods or mechanical breakdowns may interrupt mainline power, but radio station WING of Dayton, Ohio, *stays on the air*. Its dependable Onan Standby Electric Plant is always ready to take over the power load in event of power failure, supplying electricity for broadcasting and other essential uses.

WING's 35,000-watt Onan plant, Model 35JT is built for full-capacity service, powered by a heavy-duty, six-cylinder water-cooled gasoline engine. This complete unit is equipped with built-in engine-instrument and A.C. meter panel. Streamlined, compact steel housing protects plant and accessories. Low in first cost, the Onan plant operates economically and requires a minimum of maintenance during idle periods.



PLANT STARTS AUTOMATICALLY WHEN POWER FAILS

Within seconds after a break in mainline power, the Onan Line Transfer Control starts the standby plant and switches its power onto the electrical system. When service is restored, the control automatically stops the plant. The built-in rectifier, a special feature of Onan controls, keeps batteries charged at all times.

ONAN ELECTRIC PLANTS are available in many sizes and models—A.C.: 350 to 35,000 Watts in all standard voltages and frequencies, D.C.: 600 to 15,000 Watts, 115 and 230 Volts. Battery Chargers: 500 to 6,000 Watts, 6, 12, 32 and 115 Volts.

D. W. ONAN & SONS INC.

4790 Royalston Ave., Minneapolis 5, Minn.



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ONAN STANDBY POWER

SEND FOR THESE SPECIALS

ALL MERCHANDISE NEW
UNLESS OTHERWISE STATED

CAPACITORS

203 5 mfd., 350 V. DC Electrolytics	\$0.29
239 1 mfd., 1500 V. DC Electrolytics	.15
314 15 mfd., 35 V. DC Electrolytics	.15
314X 3 mfd., 450 V. DC Electrolytics	.19
327 3—1 mfd., 600 V. Bathtub	.09
343 (2) .05 mfd., 600 V. Bathtub	.09
1521 10 mfd., 1,000 V. oil-filled	1.40
2181 150 mfd. 50 V. Electrolytics	.40

RECTIFIERS

12N2 6.5 V., AC, 2.2 V. DC @ 3.0 amp. Full-wave center tap	\$1.20
2855 Selenium 180 V., 400 ma. G.E. Full-wave bridge	6.90
3048 Selenium 54 V. AC 1.6 amp., DC. Full-wave bridge, G.E.	4.40
7176 Sulphide 3.5 V. AC, 1.8 V. DC, 1-amp. Full-wave bridge	.90
7374 Selenium, 36 V. AC, 2 amp. DC, half-wave	.75
7966 Selenium No. B7DHNCM, 154 V. AC, 6-amp. DC. Full-wave bridge	6.85

RESISTORS

RS20 10,000 ohm, 20 watt, wire wound	\$0.22
RS184 450 ohm, 5 watt, wire wound	.12
7494 100,000 ohm, 1 watt	.10
2590 50 ohm, 25 watt wirewound with slider	.12

TRANSFORMERS

6AN2 Double carbon button, microphone input 18 ohms to 6,000 ohms	\$0.70
44 80-110-220 V., 50-1,600 cy, 422 V., 15 mil. CT and 6.3 V. @ 3 amp.	.95
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20	Shock Mounts, Rubber	25 for 1.00
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22	5 Mfd. Oil Filled Condensers	15 for 1.00
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24	Ass'd. Relays	6 for 1.00
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28	Push-to-Talk Toggle Switches	4 for 1.00
29	Antenna Changeover Switch	2 for 1.00
30	400Kc Plastic Antenna Plug-in coil	5 for 1.00
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RADIOCO
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Noise Suppressor.

(Continued from page 48)

Dynamic Noise Suppressors. In systems with extended low frequency response, the tendency toward oscillation as a result of acoustic coupling between the elements is greatly minimized by the dynamic action of the inductive reactance tube. In equipment where the design of the output amplifier stages and degenerative feedback circuits are not optimum for the speaker being used, the noise suppressor will reduce transient hangover effects at low frequencies. It is also true that the effects of harmonic and intermodulation distortion are actually reduced by the high frequency gate action. This is partially true because the high frequency range in which intermodulation products are likely to appear is attenuated a considerable portion of the time. Of equal importance is the fact that the tolerance of human hearing for distortion is much greater during high level passages than during quiet intervals in the music. The high frequency gates are rarely driven fully open except during fairly loud passages where the total tonal pattern is so complex that the ear is rarely able to resolve distortion components unless they are of considerable magnitude. This does not mean that it is desirable to take advantage of this effect in the design of really high quality equipment, but it does mean that radio-phonographs designed for manufacture in price ranges where economic compromises are necessary may be improved by the application of these principles.

It is extremely difficult to evaluate the noise reduction obtained with these circuits in terms that will be applicable to all conditions. In the first place, the amount of noise reduction effected by any attenuating circuit will depend upon the hearing ability of the individual listeners and their tolerance for noise of various kinds. Obviously a person with a high frequency hearing loss will not notice as much improvement, either in the noise reduction or in the extended frequency range made possible by the dynamic action. It is also true that some people have auditory peaks in ranges where noise exists, and they will observe the improvement as being especially effective. Psychological factors are also involved. Some individuals find noise more irritating than others. A curious effect is obtained with many engineers and other persons who have conditioned themselves to observing noise as a necessary associate of wide range reproduction. Often this conviction is so strong that they automatically reject the effectively noise-free reproduction obtainable with the Dynamic Noise Suppressor as being too limited in range. Only after listening carefully with the suppressor abruptly switched in and out of the circuits are

they able to accept the evidence of their own ears. Another interesting effect, which is a minor limitation on the method, is the fact that the circuits will effectively reject the sound produced by scraping on gourds with a wire brush during some Latin American rumbas as being noise and therefore will not reproduce it.

It should be remembered that the Dynamic Noise Suppressor is limited to some degree by the surfaces available and the condition of the records. It is not possible with this, or with any other device, to produce sounds in the 10 kc. range unless they are engraved on the record. Neither is it possible to retain all of the frequencies available on the record and to reject all of the noise completely if the record has been used as an ash-tray. It is possible to produce a maximum of wide range music with a minimum of noise from any one particular record, and the over-all improvement in most instances is almost miraculous.

These circuits are now out of the experimental laboratory stages and have proved their value in widespread application, both in home radio-phonograph equipment and in many AM and FM broadcast stations.

—30—

International Short-Wave

(Continued from page 134)

Zealand with news at 1445, closing down at 1500. (Milne)

Siam—HS8PD, 5.994, may vary, Bangkok, is heard in Australia at 0615 with news. (Sanderson)

South Africa—Call-sign of the new South African Air Force station is ZRB, not ZBB as previously reported; has been having trouble with transmitter but will probably be on the air by this time, operating on the hour with weather report and other data; frequency is 7.445, location is Waterkloof, District Pretoria, South Africa. (Laubscher)

Johannesburg, 9.523, is heard to 1040 on West Coast; weak but should be improving. (Balbi) The 9.870 outlet is also heard on West Coast around 0900-1110 during English period. (Dilg)

Capetown's 5.877 outlet has not been heard lately in the 2345-0130 period; may have moved. (Balbi)

Spain—Madrid, 9.368 (drifting lately as high as 9.39), begins late transmission now at 1845. (Beck) Still has news daily at 1500.

Sweden—SBP, 11.705, Stockholm, is heard in Ohio at 0140-0205. (Sutton)

Switzerland—HER7, 17.784, HER6, 15.305, heard on West Coast Fridays at 0100-0200 or later; HER5, 11.865, HE14, 11.715, heard 0200-0330, Mon., Tues., Wed., Fri., to Australia and New Zealand; HER6, 15.305, HER5, 11.865, heard 0900-1010 on Saturdays to Africa and the Orient. (Balbi)

Syria—Damascus is reported by NNRC as operating on 11.995 at 1230-1600; may be harmonic of the channel of approximately 6 megacycles.

Tahiti—NNRC reports FOSAA, 6.980, around 2330 until after 0030. Reported by Balbi, California, on Saturdays as late as 0025. (URDXC) Probably runs 2230-0030 on Tue.-Wed. and Fri.-Sat.

Tangier Zone—Radio Internationale, 6.200 (listed 6.199), has been heard in Britain with *English* at 1500 on Sunday; does not have *English* at that time every day. (Pearce) Heard in New York fairly well at 1600-1700 in Spanish and French. (Legge)

Turkey—TAP, 9.465, is being heard in Rhode Island late afternoons to 1645 sign-off; on Monday and Thursday has *English* (beamed to Britain) at 1630; usually is QRM'd by CW. (Pelland) The Sunday *Postbag* period on this channel is now at 1630, Turkey having returned to standard time. Daily news bulletin is now at 1245. (Pearce)

U. S. A.—For the benefit of readers overseas, here is a list of times of *English* newscasts from U. S. short-wave outlets:

0430—KNBA, 6.060, KCBR, 9.750; 0530, KGEX, 11.730, KNBI, 11.790, KNBX, 15.250, KRHO (Honolulu), 9.650, and Manila, 11.840; 0800, 0900, 1000, KNBA, 6.060, KGEX, 11.730, KNBX, 15.250, KRHO (Honolulu), 9.650, KCBR, 9.750, KNBI, 11.790, KWID, 9.570, and Manila, 11.840; 1100, WRCA, 15.150, WBOS, 15.210; 1200 and 1300, WGEX, 17.880, WNRA, 21.730; 1745, WRUS, 9.570; WRUA, 11.790, WGEO, 15.330, WGEA, 11.770, WNRE, 15.280, WNBI, 17.780; 2000, WRUS, 6.040, WCBN, 9.650, WLWO, 11.790, WBOS, 15.210, WLWK, 17.800, WRUW, 9.570, WRUL, 11.725, WCDA, 11.830, WRUA, 15.290; 2100, WRUS, 6.040, WCBN, 9.650; 2155, WLWO, 11.790, WBOS, 15.210, WLWK, 17.800, WCDA, 11.830, WRUA, 15.290. AFRS news is scheduled for 2215, KWIX, 9.570, KCBF, 11.810; 2300, 0000, KCBA, 15.150; 0100, KGEI, 9.530, KWIX, 9.570; 0200, KGEX, 11.730, KCBF, 11.810; 0205, KWID, 11.900; KCBA, 15.150; 0300, KNBX, 15.330; 0400, KGEI, 9.530, KCBF, 9.700; 0500, KWIX, 11.890, KWID, 11.900; 0600, KCBA, 15.330; 0700, KGEI, 9.530, KCBF, 9.700; 0800 and 0845, KWIX, 11.890, KCBF, 15.330; 1530, WNRA, 11.830, WBOS, 15.210, WRCA, 15.150, and WGEX, 17.880. (Legge)

U. S. S. R.—Although not announced, Sverdlovsk, 15.27, is being used to North America now, 1820-1950; has QRM from New York. (Beck)

Official schedules to North America daily are 0745-0815, 17.77, 15.17, 11.72, 9.65 with 11.88 and 11.75 especially for Pacific Coast; 1820-1930, 15.17, 11.72, 9.78, 9.5, and 15.23 and 11.88 especially for Pacific Coast; 1930-1950, 15.17, 11.72, 9.78, 9.5, 5.95. (Russian Embassy)

Moscow radiated in *English* for Europe at 0730 on 15.44, 11.63; at 1130 on 15.44, 11.63, 9.71; at 1330 and 1500, on 11.63, 9.71, 7.200, and 6.020. (Pearce) Most of these are heard well in the Eastern U. S.

The 9.565 outlet is being heard in



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GLENDALE CALIFORNIA

Massachusetts at 0745 with news. (Harris)

Tashkent, Usbek S. S. R., 6.825, is heard in Sweden with an *English* program at 1200-1230 on Sundays. (Holmberg) May be other days too.

Moscow beams to Latin America, 2000-2230, on 15.44, 15.17, 11.72 (Kiev), 11.63 (Leningrad), 11.83; also announces 30 and 31 meter outlets. (Beck)

Moscow's Home Service is being transmitted from 2000 on 9.72; 6.02 (Kiev), from 2300. (Beck) Frequencies most regularly heard on West Coast in Home Service after 2200 to as late as 0600, also some from 0800 on, include 15.17, 15.27, 15.34, 15.36, 15.39, 15.44, 11.72, 11.74, 11.87, 11.89; 11.88 is now used with 11.75 to Far East from 0200 or 0300 to 1000; Petropavlosk, 6.07, is heard 0145-0245 except Sunday, when schedule is irregular, usually heard from 0100: (Balbi)

Moscow is heard in Massachusetts on 7.360 and 11.630 at 1430-1500. (Simonian)

Vatican—HVJ, 15.095, 9.66, still broadcasts the news at 0900, and on 9.66 and 5.971 at 1315; for a while appeared to use 5.890 but more recently is back on 5.971. (Pearce) The morning news may soon be heard at 1000 instead of 0900 as is usually the winter schedule. Pearce, England, reports HVJ on 6.190 at 1400 with broadcast in Italian. The 15.095 channel is heard on West Coast Monday, Tuesday, at 1000-1015; on Mon. and Fridays, 0200-0215. (Balbi)

Venezuela—YV3RS, 4.990, *Radiodifusora Occidental*, Barquisimeto, ex-3.490, is now heard here; YV3RN, 4.940, *Radio Barquisimeto*, ex-4.990, is on this frequency now; YV3RM, 4.860, is a new Barquisimeto outlet, evenings. (Legge)

Yugoslavia—Belgrade, 9.418, is heard in Australia at 1615. (Sanderson). The 6.100 outlet is heard in New Zealand with news at 1530. (Milne)

Last Minute Tips

According to the *Daily Telegraph*, England, Pakistan, which was left by the partition of India with only three broadcasting stations, Peshawar, Lahore, and Dacca (all medium-wave), has decided to buy additional transmitters to give a coverage equal to that of the six stations in India. They will be bought in England if Britain can deliver them within six months. A technical expert in Britain, Riaz Ahmed, has already been in contact with the chief transmitter manufacturers and the BBC. Habib Rahimtoola, the High Commissioner, and G. A. Ahmed, the Trade Commissioner, have visited Radiolympia and also have contacted the appropriate firms. The provisional plan involves construction of a 100-kw. station, possibly at Karachi, the equivalent of the big short-wave station of AIR at Delhi. Two 20-kw. and two 10-kw. stations are also required. At a rough estimate, this contract would approx-

imate 200,000 pounds. At present, Pakistan's only telegraphic contacts with Europe are by means of lines that pass through—or transmitters in—Hindustan territory. (Brownless)

Official schedules from *Radio Tabriz*, Iran, are 0500-0700 on 11.960, news at 0630; and 0930-1300 on 6.090; on Fridays the first transmission runs 0130-0620, on 11.960. (Nankervis)

Late tips from Mervyn Laubscher, our South African monitor, include Salisbury, Southern Rhodesia, 6.12, 0430-0615 weekdays, 0330-0615 Sundays, news at 0430 (Sundays at 0330), BBC news at 0600; 3.700, 1100-1500 weekdays, 1300-1500 on Sundays, has BBC news at 1100 (except Sundays) and at 1300, 1315 (except Sundays). Bulawayo, 3.800, has a schedule similar to that of Salisbury. ZNB, 5.900, Mafeking, Bechuanaland, is scheduled 0600-0700 and 1200-1430 on weekdays, at 1300-1430 on Sundays; has SABC news at 0615 (except Sundays) and daily at 1200. CR7AB, 4.390, Lourenco Marques, is scheduled weekdays at 1100-1700, Sundays at 1000-1700, all music and sponsored programs; CR7BV, 4.90, same as CR7AB, no news; a frequency of about 9.715 appears in use on Sundays at 0200-0700. Lourenco Marques continues to change frequencies and schedules often; latest frequency is about 4.8 or slightly higher; 9.645 is strong, while a very weak parallel station is noted on about 9.655; schedule of these seems to be 0000-0100, 0430-0630, 1100-1500.

Horst Miers, Berlin, reports *Radio Stuttgart*, 6.190 (listed 6.179), testing Sunday afternoons; asked for reports to Radio Muenchen, ABT Technik (13b), Muenchen, Rundfunkplatz 1, Germany. Hakansson, Sweden, reports this station at 0830-1100 when is buried by Oslo. Is probably *Radio Muenchen*, Munich, listed on 6.190, and likely is relaying Stuttgart.

W. L. Harrison, chief engineer, National Broadcasting Service, Wellington, New Zealand, informs me "owing to the shortage of staff and material generally, the installation of our equipment has received several setbacks, and we are not yet ready to commence the Overseas Service." Watch for the new transmitters from this country, probably testing on 9.54 and 11.78 soon, around 0400-0500.

The Free Indonesian Radio, 11.001, Djokjakarta, Java, recently announced that the present 2-kw. transmitter would be increased to 100 kw. soon. (Anderson)

The Finnish Ronne Expedition, location given as the Margaret Bay area of the Antarctic, calls assigned are KQL, KICJ, and AYZH; frequencies available are 9.135, 12.862.5, 11.340, 17.310, 22.225, 22.250; these are crystal controlled; also may use about 16.210, and a 10-meter "ham" frequency on oscillator. (Arthur)

VS4S, 7.237, Jesselton, British North Borneo, 1 kw., is listed as operating on this frequency. (Legge) *Has any one heard this one?*

A station heard in Britain on 12.000

announcing "Huna Damash," good level afternoons but with bad CWQRM, is believed to be Damascus, Syria; usually has all-native programs although on occasion does play western recordings; closes at 1500 with a military march, after a short news bulletin in Arabic; generally gives a talk or news in Arabic at 1335-1350, prefaced and ended by a short piece of band music. (Pearce)

The BBC is using GSS, 26.550, in parallel with GSK, 26.100, at 0600-0900; strong signal on both. (Howe)

A station heard irregularly around 1700-1745 on 5.942 is believed to be OXI, Godthaab, Greenland; broadcast is in Danish. (Legge)

WFI-2, about 7.350, Virgin Islands, has been heard at 2050-2100 calling Southampton, New York, for frequency check; good level. (Pelland)

At last report, CR8AA, 9.254, *Macao Radio Club*, was off the air. (Pearce)

An Indonesian station operating on about 11.25 has news at 0700. (Sanderson, Milne)

XGOY, Chungking, was heard at 0525-0615 recently on 6.154. (Carter) May have been a test. This approximate frequency was used last winter.

ETAA, 15.070, varying, Addis Ababa, was recently heard in Ohio at 0300-0400 with western recordings. (Sutton) Not heard lately in Britain. (Brownless)

Pearce, England, reports a new station on approximately 6.240, heard from 1500 to 1600 some days, other days around 1400-1500; announcements by woman in what appears to be Nordic languages; plays all recordings, many of them *English*, but no *English* announcement is given; no anthem played at closedown. Has QRM from Russia. *Can anyone identify?*

Radio Omdurman, 13.320, Anglo-Egyptian Sudan, is heard in Ohio on Fridays at 1230-1300 with *English* program. (Sutton)

A Danish monitor, Thomas Langsig, reports HVJ, 15.095 and 9.66, with news at 0900 now. He also reports Belgrade, 9.503, heard at 0800; says Luxembourg is still testing on 15.350, 6.090, 9.527, and wants reports; latter confirmed by Yelitza Theodor, Rumania.

EPB, 15.100, Teheran, is being heard in Chicago at 0715 with news. (Hofert) Still good in East at that time, signs off 0730.

ZQP, 9.710, Lusaka, Northern Rhodesia, signs on at 1000; on Tuesdays has *English*; also is on 7.22, 3.914 but these are not heard in Australia, according to George Major, Manjimup, Western Australia.

The woman announcer at XNCR gives frequency as 7.500, gives XGNC as 6.570, and XGHT as 6.096; however, these Communist-controlled Chinese stations, vary greatly from announced frequencies, and from day to day; news now ends around 0755; XGHT leaves the air at 0900, others at 0930 lately; signature appears to be "La Paloma." (Dilg)

The BBC's New York office listed to
January, 1948

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Tommy Kneitel, New York City, these five stations located at Royal Observatory (Greenwich), Abinger Magnetic Station, near Dorkin, Surrey, England: GKU4, 4.025; GKU2, 17.685, GYB8, 19.080; time tick services from 1255-1300 on GIC, 8.640, and GKU3, 12.45. It was also explained that BBC call letters are not used at the microphone but that announcers are instructed to specify frequencies either in megacycles per second in the appropriate meter band, or by reference to the meter band only.

Official QRA of "Voice of America in Manila" is The Department of State, Office of International Information and Culture Affairs, International Broadcasting Division, c/o The American Embassy, Manila, Philippine Islands. (Radio Australia)

VP4RD, *Radio Trinidad*, 9.645 (listed 9.625), Port-of-Spain, Trinidad, has been heard in England at 1700-1800. (Brownless) A Port-of-Spain station on 14.975 has been heard at 1415 contacting VRR4, Kingston, Jamaica. (Legge via NNRC)

KZRH, 9.64, Manila, is reported to recently have been heard announcing the call-sign of its alternate transmitter, KZMB. (Radio Australia).

Acknowledgement

Many thanks for all the FB reports received during 1947. Keep up the good work by sending your reports to Kenneth R. Boord, 948 Stewartstown Road, Morgantown, West Virginia, U.S.A.—K.R.B. —50—

Recording of Sound

(Continued from page 56)

circuit, any signal developed by the tube will also appear across the resistance. This signal voltage is opposite in phase and in series with the voltage impressed on the grid and cathode of the tube. Degeneration takes place and the amplification of

the tube is reduced. In this application the plate loading resistor, R_{11} , is made small and the cathode resistor, R_{12} , large so that a greater part of the voltage developed by the tube appears in the cathode circuit.

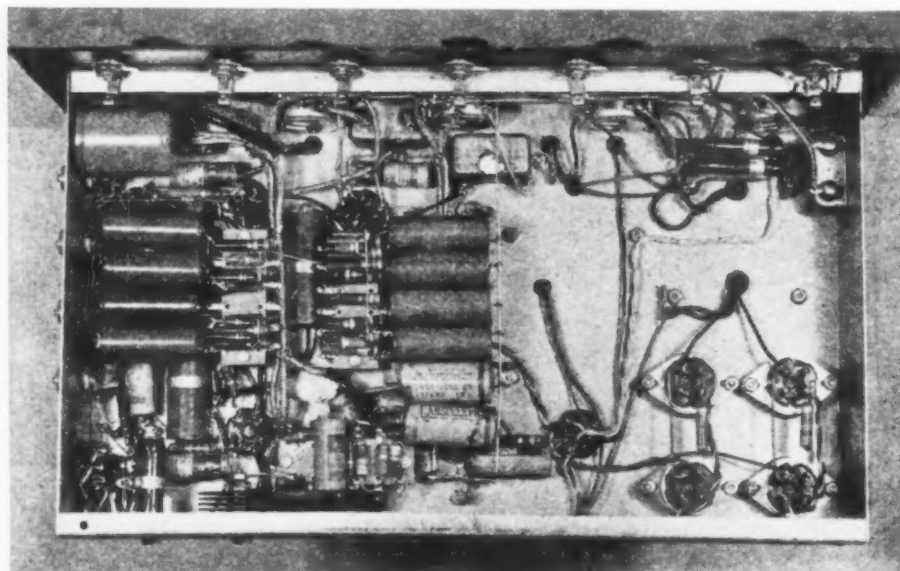
Since the circuit is resistive, there is little or no frequency discrimination at audio frequencies and all frequencies are degenerated in an equal amount. If the cathode resistance is shunted with an inductance of proper value, the resistance at low frequencies is practically shorted out due to the low impedance of the choke at low frequencies. Therefore, degeneration of the low frequencies is eliminated and the greater part of the signal developed by the tube appears across the resistor, R_{12} . The result is an increase in the low frequency response of the circuit.

On the other hand, if a condenser of proper value is shunted across the cathode resistor, the low impedance of the condenser at high frequencies reduces the impedance of the circuit. Degeneration of the higher frequencies is accordingly reduced and the high frequency response of the circuit is increased.

Attenuation of the low frequencies can be accomplished by shunting the grid circuit of the following stage with a choke or inductance. The value of the choke, CH_1 , used in the bass boost circuit, also has the correct value for an attenuation circuit. The high frequencies can be attenuated by shunting the same grid circuit with a suitable condenser.

The function of control, R_{23} , is to introduce the choke, CH_1 , into either the cathode circuit for bass boost or into the grid circuit for bass decrease. Control, R_{23} , applies condenser C_{21} to the cathode circuit for treble increase or C_{22} to the grid circuit for treble decrease. The controls are coupled to the cathode through condenser C_4 and to the following grid by a shielded lead. Shielding of the choke is ex-

Fig. 5. Bottom view of amplifier showing proper location of all components. The tone control choke is mounted in the upper left hand corner of chassis.



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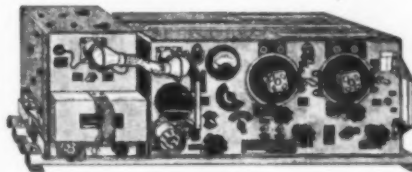
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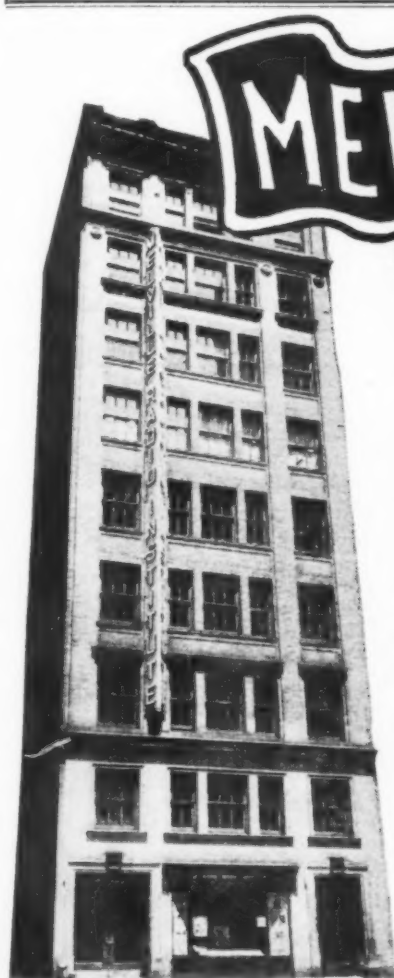
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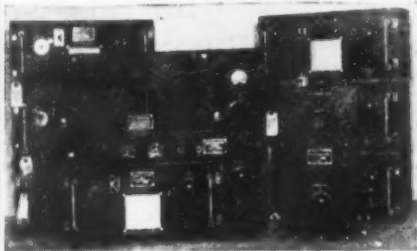
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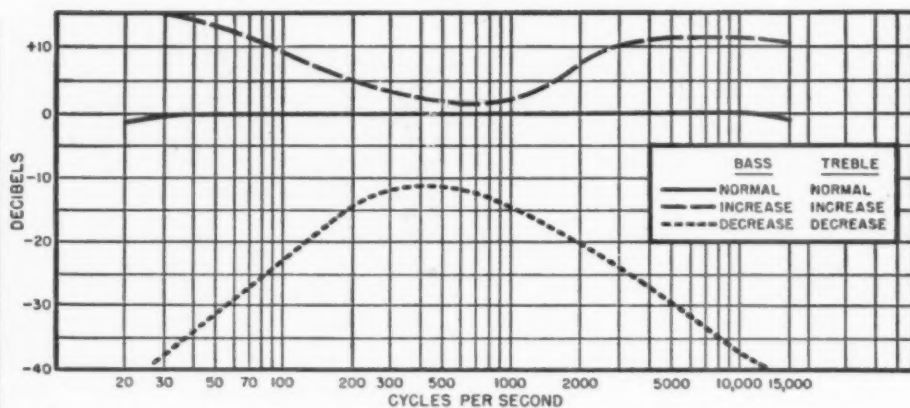


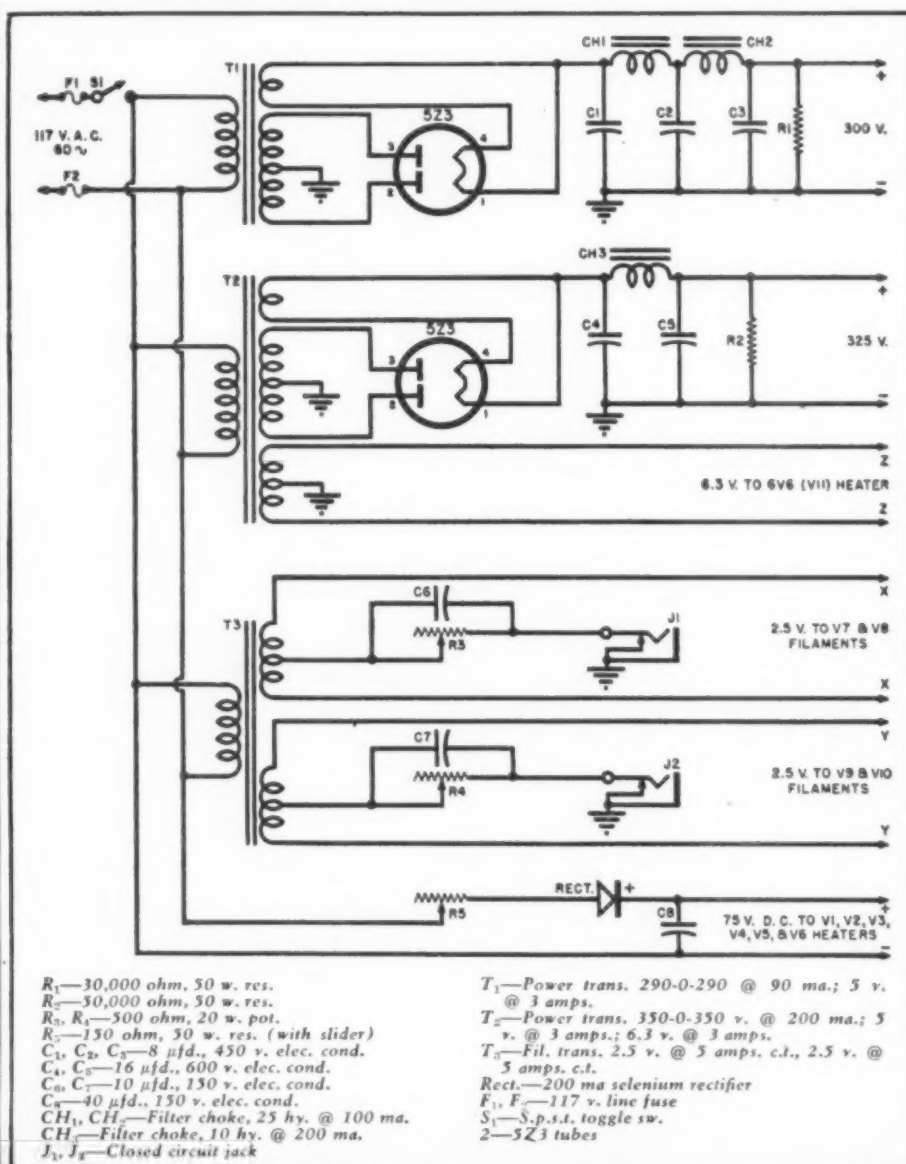
Fig. 6. Audio response curves for various combinations of bass-treble control settings.

tremely important. It must be oriented physically on the chassis for lowest possible hum pickup. In the amplifier described, the best location was found to be under the chassis directly below the tone controls. Shielding must run all the way to the bottom of the choke.

The low frequency control will boost

12 db. at 60 cycles (in the maximum boost position) or attenuate 28 db. in the cut-off position. The high frequency control will boost 12 db. at 10,000 cycles in the maximum boost position or attenuate 35 db. in the maximum cut-off position. This range permits complete tonal balance of the system for all audio applications.

Fig. 7. Schematic diagram of the power supplies. Outputs are fed to amplifier through heavy cable. Plate current may be measured at jacks, J₁ and J₂.



R₁—30,000 ohm, 50 w. res.
R₂—50,000 ohm, 50 w. res.
R₃, R₄—500 ohm, 20 w. pot.
R₅—150 ohm, 50 w. res. (with slider)
C₁, C₂, C₃—8 µfd., 450 v. elec. cond.
C₄, C₅—16 µfd., 600 v. elec. cond.
C₆, C₇—10 µfd., 150 v. elec. cond.
C₈—40 µfd., 150 v. elec. cond.
CH₁, CH₂—Filter choke, 25 hy. @ 100 ma.
CH₃—Filter choke, 10 hy. @ 200 ma.
J₁, J₂—Closed circuit jack

T₁—Power trans. 290-0-290 @ 90 ma.; 5 v. @ 3 amps.
T₂—Power trans. 350-0-350 v. @ 200 ma.; 5 v. @ 3 amps.; 6.3 v. @ 3 amps.
T₃—Fil. trans. 2.5 v. @ 5 amps. c.t., 2.5 v. @ 5 amps. c.t.
RECT.—200 ma selenium rectifier
F₁, F₂—117 v. line fuse
S₁—S.p.s.t. toggle sw.
2—5Z3 tubes

During "sound effects" recording, the author employs the treble-bass cut-offs to simulate the tonal qualities of a carbon telephone. In this position both high and low frequencies are severely attenuated and only the middle frequencies are amplified. Other applications similar to this will be obvious to the reader.

During recording at 33 1/3 r.p.m., the high frequencies are greatly accentuated (boosted) to compensate for the reduced velocity encountered when cutting small diameters on a recording disc. This boost is reduced as the cutter travels away from the hub of the disc and approaches the larger diameters with a resulting increase in linear velocity of the whirling disc.

The bass control remains at its normal or mid-setting during recording. If an attempt were made to employ bass boost during cutting, there would be a tendency to over-modulate the record. The result would be distortion in adjacent grooves (crosstalk) or even a cutting through from one groove to the next.

During playback, the process may be somewhat reversed, i.e., a bass boost may be employed and high frequencies may be either attenuated or adjusted to suit the individual listener.

Shielding is of the utmost importance in keeping the over-all hum under control. All grid and plate leads should be shielded as well as the metal can type condensers C_6 , C_7 , C_{10} , C_{11} . All shielding should run as close as possible to the soldering lugs and the shields should be grounded near the source of signal.

It is highly important to use *only one ground lead* to chassis in the entire amplifier. The best point can be located only by experiment. In the amplifier shown in Figs. 1, 3, and 5 this was found to be at the cathode of the 12SL7.

Special attention should be given to the polarity of all coupling condensers. The outside foil (ground) should in all cases be connected to the point of lowest impedance. In certain cases it might be advisable to completely shield all coupling condensers. A heavy copper wire or braid is also desirable from amplifier to ground.

Bonding via copper bus is sometimes needed between amplifier and tuner.

One of the requisites for accurate recording is an excellent monitor amplifier and speaker so that sounds entering the cutter may be heard simultaneously. It is not considered good practice to shunt a speaker load across a cutter. The load presented by the speaker varies with frequency. This variation disturbs the normal impedance of the cutter. A separate channel is provided, employing a 6V6, which receives its signal from the 500 ohm output winding of T_2 . Operating Class A, the tube draws no grid current and therefore does not upset or take power from the 2A3's.

A separate gain control, R_3 , permits individual volume control setting of this channel. The output transformer,



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T_1 terminates in the jack, J_1 , so that a speaker or wire recorder may be readily connected. It should be pointed out that patch cords made up from standard shielded phone plugs are used to connect through the various jacks on the panel.

It is important to observe proper polarity in making up the cords. The outside shield in all cases should connect to the outer end of the plug, while all hot leads through the inner conductor terminate in the phone plug tips.

The two load resistors, R_{21} and R_{22} , provide a fixed load across the output transformer secondaries when external speaker or cutter leads are removed. This affords proper loading protection to the transformers.

The meter, M , is a standard $-10 +6$ decibel meter calibrated for use across a 500 ohm line. Suitable series resistors are arranged in conjunction with a multiplier switch to extend the meter range to $+24$ db. in steps of 6 db. The values of these resistors are dependent upon the individual make of meter used.

The top view of the chassis (Fig. 3) shows three miniature tubes lined up in back of the meter. These are used

in the Scott Dynamic Noise Suppressor circuit described on page 46 of this issue. The toggle and rotary switches on either side of the meter are also required in the Scott circuit.

The reader is urged to follow the layout of all component parts carefully. Failure to do so may result in unsatisfactory performance. All filament wires should be tightly twisted and laced and kept clear of all grid and plate leads. The connector receptacle, shown mounted near the input connectors, was moved to the back edge of the chassis near the 6V6 because of a slight hum pickup caused by the close proximity of the cabling to the input channels. Metal shields were also found to be needed on the 12AH7's.

The chassis is mounted on a standard 7" x 19" steel panel. The jack panel measures 1 1/4" x 19". The decorative strip was added to enhance the appearance of the amplifier.

The results obtained with this amplifier more than satisfy the most critical listener. Quality comparable to fine broadcast equipment has been achieved and we feel that many readers will want to duplicate this unit.

(To be continued)

Engineers for WTMJ-TV, The Milwaukee Journal television station, were erecting the new RCA microwave relay transmitter on the roof of the South Side Armory in Milwaukee, Wisconsin the day this picture was taken. Used for the remote pickup of television programs, this "dishpan" is beamed to a microwave receiving unit installed on the tower at "Radio City" located five miles north of Milwaukee. From this point programs are televised to the Greater Milwaukee area. The new station, which began operation December 3rd, telecasts five days a week, Wednesday through Sunday, for a total schedule on the air of 20 hours per week.



Spot Radio News

(Continued from page 20)

actual saturation if we allow an average of four radios to every home. Thus, if this goal of an average of four radios for every home is practicable and attainable, we've got a long way to go before we reach the saturation point." In terms of set sales, the radio-in-every-room campaign becomes even more significant. "At the beginning of 1947," says Mr. Balcom, "there were 38,128,000 families in the United States and an estimated 34,800,000 of them had at least one radio in their homes. If the prewar concept of saturation is used, this means a sales potential of only about three and a quarter million more home sets, plus replacements, to reach 100 per-cent saturation. But if the new concept of four sets per family is taken as a goal, the potential market for new home sets, not counting replacements, is close to one hundred million."

WHATEVER THE FUTURE sales totals, the RMA head is able to report that anybody buying a set today is getting a bargain in terms of current inflated values. "Everybody talks about high prices," he says, "and radio set prices naturally have risen above prewar levels, chiefly because production costs have forced them up. Factory labor costs alone are 69 per-cent higher than they were prewar, and component prices to the manufacturer are similarly much higher because of their own higher production costs. But today's radio receiver prices, when measured against current factory wages, are below what they were in the 1920's and in the 1930's up to 1938. In 1929, for example, a radio of average price cost a worker about three and a third weeks' wages, and in 1937 this price had dropped to two and a third weeks' wages. By comparison, a radio of average price today sells for the equivalent of less than one and a half weeks' work at present-day factory wages." He adds that this price, in terms of comparable factory pay, is less than at any time in the industry's history except for a few years before the last war, when all prices were at a record low level.

WHILE TELEVISION will make great forward strides in the near future, consensus of the industry would seem to indicate that straight broadcasting will never be supplanted by video. "Television alone will revolutionize broadcasting," Mr. Balcom believes, "just as the talking movie revolutionized the motion picture industry. But in my opinion there will always be an insistent public demand for certain types of radio programs which can be listened to without requiring that the listener sit down and watch a visual screen. The housewife, for instance, will want to tune in a musical program, perhaps a soap opera, or a program of household hints,

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while she does her housework, and there will be many times during the day when she won't find time to watch television. School children, who in this generation have learned to do their homework while listening to the radio, will find it hard to watch a television screen and do their algebra or Latin simultaneously."

FACT IS, more and more school kids will be using the radio straight for educational purposes, putting their textbooks aside while they do it. This is implicit in the recent (and excellent) report on the use in schools of sound systems and recording and playback equipment, prepared by RMA and the U.S. Office of Education. Indeed, after reading the RMA-USOE report, it becomes clear that a modern youngster could get his entire education via sound, never opening a textbook. Three major methods of recording and reproducing are covered—mechanical, as typified by the phonograph and transcription disc; magnetic, in which the sound is recorded on wire, tape or other suitable medium; and photographic, such as is used in sound motion pictures. The report, which goes to leading educators in booklet form, features a series of drawings with the text. Although written expressly for school personnel, the report will undoubtedly be of value to audio equipment manufacturers and to industrial educators and training experts. The report is a community project, and scores of experts in radio and education share the honors for its excellence. Among these are Lee McCanne, of Rochester, N. Y., chairman of the RMA School Equipment Committee; Dr. R. R. Lowdermilk of the U.S. Office of Education; C. F. Gill of Rochester, N. Y.; M. U. Bildersee of the N. Y. State Education Department, Albany; C. E. Palmer, Dover, O.; Ellis Miracle, Zanesville, O.; A. K. Ward and S. B. Hughes, Camden, N. J.; Henry F. Kuhlman, New York; W. B. Levenson, Cleveland, O.; E. H. Andreson, Chicago; Paul Haeseler, Newark, N. J., and Charles P. MacInnis, Columbia, S. C. The booklet is titled "School Sound—Recording and Playback Equipment." Single copies can be had for free from the Radio Section, U.S. Office of Education, Washington, 25, D. C., or the RMA, 1317 F Street, N.W., Washington, 4. RMA, who published the booklet, will also quote bulk prices on request.

RMA HAS BEEN signally active on the booklet front recently. Another much-needed job has been done by them for apartment house owners harried by tenants with television sets. Pointing out that many an owner, especially of high-priced apartment houses, has been dogged recently by the problem of finding enough space on his roof for the antennas desired by tenants, RMA offers as a solution a distribution system which uses an antenna or combination of antennas, an amplifier, cables, and an

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outlet box for each apartment. This solves the roof problem and assures each tenant good reception. "The antennas," the booklet explains, "are mounted on the rooftop and are oriented or sited at the time of installation so as to give the best reception for each station in the vicinity"—a great boon to the individual apartment renter, who thus can dismiss a major servicing problem. "Where strong signals for the transmitter are available—such as might be the case in the center of a city—or where there are only a few receivers drawing from the system, amplifiers may not be required." Cost of installation of the system largely depends on cost of the cable installation, but will take care of the landlord's television problems for years to come. "The maximum number of receivers that can be connected," RMA adds, "is unlimited." The RMA booklet was prepared under the direction of W. P. Short, of the Federal Telephone & Radio Corp., New York, chairman of a special RMA subcommittee of the Association's engineering department committee on television receivers.

WHO WILL BE the permanent chairman of the Federal Communications Commission was still anybody's guess as this went to press. The post was made vacant by the resignation of Charles R. Denny early last fall. It was filled on a temporary basis by Paul A. Walker, one of the Commission members. Walker is a Democrat, and has been mentioned as a possible permanent chairman. So has another and more liberal commissioner—Clifford J. Durr; but the industry is inclined to regard his New Deal background with a somewhat jaundiced eye. Whether Mr. Truman might take a different view of Commissioner Durr could depend on political trends in the near future. Speaking of politics, it is understood that the President is determined to hold off appointing anybody permanent until after the special session of Congress. This is in line with general White House policy these days—to keep things political as quiet as possible until the special session cracks the hard nuts before it. Another New Deal candidate is Wayne Coy, FDR young man who figured during that regime and who has more recently gained some practical radio experience as manager of the Washington Post's station, WINX. Another candidate with FCC experience is General Telford Taylor, who was FCC general counsel before he went away to war and was succeeded by Mr. Denny. Denny later went on to become chairman. A candidate who, according to the experts, is not being considered in a big way is J. Leonard Reinsch, radio advisor to the President. Story is that Mr. Truman has had some bum steers from Mr. Reinsch and has scratched him from the list of prospects.

IF YOU HAVEN'T had time to look it up and look it over—speaking of January, 1948



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FCC—they came out recently with an analysis of factors for and against standard broadcasting prosperity. Of the factors favorable to an expanded broadcast industry, they list general prosperity, increased advertising efforts, a tendency to increase the size of radio audiences, and certain advantages of radio over other advertising media. Hindering prosperity would be a depression, sharper competition from other media, and the high cost of running a station, among other things. "That the outlook for broadcasting is one of increasing competition is an understatement," FCC concludes.

HAM HISTORY was made by the FCC in 1947 when they waived a long-standing and hotly-defended rule, the one that requires amateur call letters be assigned systematically to prevent partiality. Regardless of this rule, which FCC has stuck to through thick and thin in self-defense, they granted Ernest Melvey of Seattle, Wash., permission to change his amateur station call letters from W7HVS to W7HUX. Mr. Melvey didn't have any drag or friends in high places, but his reason for wanting the new letters was good enough for the Commission. They had been used by his late son, Robert, killed in action aboard the cruiser Nashville when the ship was hit by a Japanese suicide plane. His dad wanted the letters "in remembrance of the good times" he and his son had had on the air together. . . .

FCC HAS made another valiant sortie against government red-tape, simplifying its broadcasting application forms and cutting their number from twenty to seven. Applicants for new standard, FM and television stations all now use the same form, instead of three different ones. Applications for licenses and renewals, assignment of construction permits and licenses and transfer of control are likewise unified. Details have also been cut. For instance, if an applicant feels that it's too much trouble to furnish an unusually large listing of all parties involved, he may get a waiver and cut the list to the bone. FCC hopes that it will not only cut down applicant work, but the work of the Commission when processing the forms.

CLAIMING TO BE the most extensive airline-owned station in the world is a new one with a normal operating range of 3500 miles, now abuilding at Haneda airport, near Tokyo. Northwest Airlines is fathering the project. The station will serve planes over the north Pacific from the U. S. and Alaska to Tokyo, Seoul, Shanghai and Manila, and will eventually offer service to other international airlines operating into Tokyo. Future plans may result in the station being operated by Aeronautical Radio, Inc., on a cooperative basis for all airlines in the area. The station will have two five-channel, three-kw. Wilcox transmitters. A battery of rhombic anten-

JANUARY SPECIALS

Volume control kits (25 am't)	\$1.95
Resistor kit (100 am't) 1/2, 1; 2 watts	1.49
Pilot lights (50 am't)	2.25
Knob kit (25 am't)	1.95
Socket kit (25 am't)	1.95
Selenium rectifier—100 mil.	.85
Auto vibrator, standard 4 prong	.95
Crystal pick-up arm	2.25
Television or FM lead-in wire, 300 ohms, 100 ft.	2.70
General instrument, auto rec. changer	14.95
Variable condensers, 2 gang, 450	.75
New Army headphones, 6 ft. cord, PL55 plug	1.49
Bleeder condenser 100K ohms—150 v.	.29
Paper cond. 2 mfd. 800 w.v.	.29
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- # 1 * 6 TUBE BEACON RECEIVERS—Incorporates superheterodyne circuit; Three gang planetary drive tuning condensers; 1—6K7 RF; 1—6SA7 Conv.-Osc.; 1—6SK7 IF; 1—6SF7 Det.-1st audio; & 2—25L6's output. Freq. 200 to 400 KC.
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- # 2 * 5 TUBE BEACON RECEIVERS—Same as above except tube line-up as follows: 1—6K7; 1—6SA7; 1—6SK7; 1—6SQ7; & 1—28D7 dual pentode pwr. output. Complete with tubes & in good operating condition—\$3.95.
- # 3 * MARKER BEACON RECEIVERS—75 MC.; 1—12CA4 & 1—12SQ7 tubes & SENSITIVE, ADJUSTABLE RELAY—closes at 4 ma. & opens at 2 ma. May be used to control external circuits from received signals, or to control models; open doors from a distance, etc.
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nas directed toward Shemya in the Aleutian Islands, Manila, Shanghai, Wake and Guam will provide extraordinary range. The station is the first of a series to be set up in the Orient under a cooperative arrangement with other airlines.

SERVICE ORGANIZATIONS

WE ARE pleased to add two more names to the growing list of radio servicemen's associations in the United States, Canada, and Scotland.

The following names and officers should be added to your list:

Association of Radio Technicians; Homer L. Davidson, President, 1726 Central Ave., Fort Dodge, Iowa; Don Sinclair, Sec'y, 405 O St., Fort Dodge, Iowa.

Orangeville District Radio Electronic Technicians Assoc., Orangeville, Ontario, Canada; President, Jim Musselman, Dundalk, Ontario, Canada; Sec'y-Treas., Victor Sharp, Box 414, Orangeville, Ontario, Canada.

Also the following correction should be made:

The name of Associated Radio Dealers of Columbus should be changed to Associated Radio Service Dealers (of Columbus), 2552 North High St., Columbus, Ohio; G. L. Riebel, President, Riebel's Appliance Shop, 1190 North High St., Columbus, Ohio.

New officers of the Akron Radio Technicians Association include: George Phillips, President; Harry Hess, Vice-President; Cliff Kehrle, Treasurer; and Del Bruner, 24 Byers Ave., Akron, Ohio, Secretary.

Radio Technician's Guild, Whaling City Chapter; Al Wobbecky, President; James R. Shepley, Secretary, 110 Topham St., New Bedford, Massachusetts.

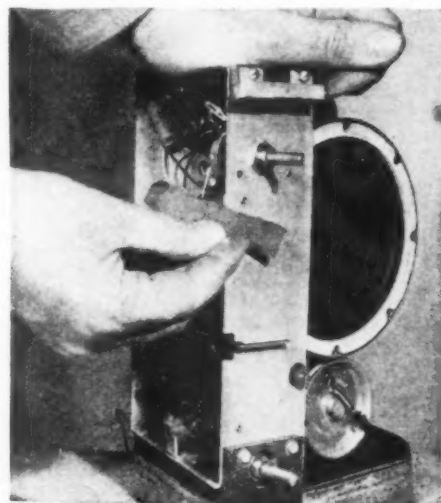
The November RADIO NEWS carried a complete list of servicemen's organizations on page 164, while several new organizations were listed on page 165 of the December issue. Any further additions or corrections for these listings will be welcome at any time.

DIAL POINTER TROUBLE

CERTAIN radios use a dial pointer arranged to slide along the chassis edge, behind a glass numbered dial.

Sticking often occurs due to rough spots or burrs on the metal edge.

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January, 1948

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Grand Rapids, Mich.

Louis Berkowitz,
Allston, Mass.

James R. Boyd
(W8WDL),
Toledo, Ohio

Herbert S. Brier,
Gary, Ind.

W. H. Cooney (W8LM),
Conneaut, Ohio

Harry Greene,
Long Island City, N. Y.

Chris E. Hobson
(W3AER),
Wilkinsburg, Pa.

T. Huntley (W6LIP),
Encino, Calif.

George C. Lefevre,
Carlisle, Pa.

E. W. Melin (W2JTA),
Montclair, N. J.



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Rev. Palmer H. Plourde
(W7KFD),
Bisbee, Ariz.

Ed. G. Raser
(W2ZI/W2ZQ),
Trenton, N. J.

P. M. Ross (WBNX),
Carlstadt, N. J.

Virgil F. Schaffer Jr.,
Minneapolis, Minn.

Albert A. Scharwachter,
Oceanside, Long Island,
N. Y.

E. V. Schwartz
(W6DMB),
Los Angeles, Calif.

Capt. W. A. Trembly,
UAL, Burbank, Calif.

Dr. Arthur W. Woods,
Birmingham, Ala.

Otto L. Woolley
Colorado Springs, Colo.

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R-80 () PR	AN/PRC-4	SB-20/GT
SCR-729	AN/PRC-3	T94 to 99 CRT-2
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January, 1948

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Ward Model 64BR-1808A	May
Ward Model 74BR-1055A	Aug.
Westinghouse Models H-104, H-105, H-107, H-108	Apr.
Westinghouse Models H-110, H-111, H-137, H-138	May
Westinghouse Model H-133	Dec.
Zenith Models 4K016, 4K035	Mar.
Zenith Models 5D011, 5D027	Feb.
Zenith Models 5R080, 5R086	May
Zenith Models 6D014, 6D029	Dec.

CODE

Build Your Own Automatic Key (Gunkel, W6NMS)	51 Dec.
Simple Code Practice Oscillator (Turner, W1AY)	88 Feb.
The Electrex—A New Automatic Key (Dixon, W4AJY)	38 Jan.

COMMUNICATIONS

Generating Microwaves (Freedman)	35 Mar.
Mobile Radio-Telephone Service Links Nation (Butler)	45 May
Robot Telephone (Laden)	39 Aug.

CRYSTAL DIODES

Crystal Diode Applications (Hoadley)	43 Jan.
Crystal Diode Reduces Probe Size (Bein)	52 Feb.
Sensitive Probe Uses Crystal Diode (Turner, W1AY)	68 May

ELECTRONICS

An Electronic Photo-Timer (Gallegos, W0SQS)	50 July
Electronic Photoflash Unit (Many)	44 Dec.

EQUIPMENT (TEST)

A Capacitance Test Bridge (Heinrich)	42 Aug.
A Modulated R.F. Signal Generator (Hayman, W2FYW)	56 June
A New All-Purpose Signal Tracer (Litt)	36 Jan.
A Pocket Signal Generator (Blundin)	61 July
A Pocket V.T.V.M. (Turner, W1AY)	64 Nov.
A Practical Vibrator Tester (Bowles)	48 Sept.
A Serviceman's Tube Tester (Lingel)	57 Oct.
A Simplified Signal Generator (Pratt, W8SEA)	42 Oct.
A Universal Voltmeter (Carlisle)	64 June
Build This Radioman's R-C Bridge (Turner, W1AY)	61 Apr.
Distortion Analyzer (Goode)	60 Feb.
Home Constructed V.T.V.M. (Carlisle)	54 Jan.
Micrometer Tuning Signal Generator (Miller)	57 May
New AM-FM Signal Generator (Dexter)	58 Dec.
Pocket Stethoscope (Farnsworth)	62 Nov.

TRANSFORMERS

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115v. AC 50-60 cycles

Filament—Sec. #1, 2.6v. 10 amps., Sec. #2, 6.4v. 5.5 amps. CT., Sec. #3, 6.4v. 1 amp., Sec. #4, 8.5 amps.	\$3.95
Sec. #1, 6.4v. 21.5 amps., Sec. #2, 2.1v. 2.0 amps., Sec. #3, 6.4v. 1.0 amp.	3.95
Plate—115v. 60 cycle input Sec. 1250v., 262 MA DC CT., Sec. #1, 680v. 115v. 60 cycle input, Sec. #1, 680v. 225 MA, Sec. #2, 1540v. 20 MA.	6.95
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	2.95

TUBES

705A	\$4.95	715A	\$4.95	2X2	\$0.80
708A	2.60	616	.99	6A6	.80
713A	2.75	6AG7	.99	6B7	.80
717A	2.75				

TUBES—JAN.\$0.49

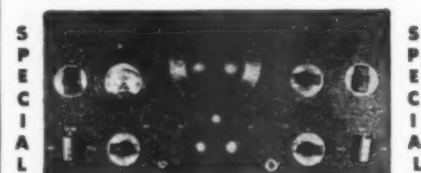
5U4	12A6	6SG7	6H6	2050
6J5	6SL7	6SC7	617	2051
6K7	6SN7	12H6	6SK7	
Relay Dumco Type 115v. AC coil, 60 cycle contacts 115v. AC 30 amp.				\$2.95
Motor, Bodine, 115v. 60 cycle, 1/50 HP, 1725 RPM, W 6.1 gear				0.35

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CD Type TJH 1 mfd @ 2000v.	1.35
CD Type TJH .5 mfd @ 2000v.	1.25
Bathub Types—1 mfd @ 600v., 26c; 25 mfd 600v., .5 mfd @ 600v., 26c; 25.25 mfd 600v.	.39
Mica—.01, .02, .001, .03 @ 1000v.	.39
.005 mfd @ 3000v.	.43
.0008 mfd @ 5000v.	.63
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Putting the New Small Meter to Work (Turner, W1AY).....	52 Jan.
RC Audio Oscillator (Goode).....	46 Jan.
Simple Troubleshooting Aid (Mondello)	88 Sept.
The Sweep-Frequency Signal Generator (Endall)	47 June

FREQUENCY MODULATION

A New 88-108 mc. FM Tuner (Urban, W2NEM)	41 July
Applying the 1N34 as Discriminator for FM (Chalfin).....	55 Mar.
A Simple FM Converter (Finley)....	50 May
FM Tuner Conversion with LC Circuits (Chalfin)	51 May
FM Receiver Alignment (Abend)....	66 Oct.
Low-Cost FM Tuner (Najork, W2HNH)	54 Nov.

GENERAL

An Experiment in Voice Controlled Relays (Wortman)	56 Dec.
A Novel Input Circuit (Hof).....	90 May
A 10 KC. Suppressor (Kauke).....	46 Mar.
A Two-Tube Intercom (Pray).....	54 Aug.
Capacity Operated Relays (Rowe, W2FMF)	50 Feb.
From a Tiny Acorn Grew a Mighty Oak (Butler)	41 June
Hands That See.....	66 Dec.
High Frequency Local Oscillators (Fishman)	54 Apr.
High Quality from Standard 5-Tube Receiver (Eannarino)	47 Nov.
Practical Transformer Design and Construction (Part 1) (Roeschke).....	60 June
Practical Transformer Design and Construction (Part 2) (Roeschke).....	58 July
Practical Transformer Design and Construction (Part 3) (Roeschke).....	60 Aug.
1947 Radio Parts and Electronic Equipment Conference and Show. (White)	54 May
Sound Broadcasting from Airplanes (White)	66 Sept.
10.7 mc. I.F. Transformers (Michalowicz)	55 Dec.

INSTRUCTION (COURSES)

Practical Radio Course (Part 51) (Ghirardi)	44 Jan.
Practical Radio Course (Part 52) (Ghirardi)	58 Mar.
Practical Radio Course (Part 53) (Ghirardi)	66 May
Practical Radio Course (Part 54) (Ghirardi)	62 July
Practical Radio Course (Part 55) (Ghirardi)	70 Oct.
Practical Radio Course (Part 56) (Ghirardi)	68 Nov.
Practical Radio Course (Part 57) (Ghirardi)	68 Dec.

METAL LOCATORS

The Modern Divining Rod (A. Kaufman)*	41 Apr.
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OSCILLOSCOPES

3" Oscilloscope (Hoadley).....	63 Mar.
--------------------------------	---------

PHONO

A New Synchronous Motor (Everett).....	84 Feb.
One Tube Phono Oscillator (Williams, W7HYA)	52 June
Wireless Pre-Amp (Parmenter).....	64 Oct.

POWER SUPPLIES

High Voltage R.F. Power Supply (Price)	54 July
R.F. Power Supplies (McGuire, W9ZGR)	51 June

RADAR, SONAR, ETC.

Radar on the Great Lakes (Schorr).....	35 Feb.
Sonar—The Submarine's Nemesis (McProud)	47 Mar.

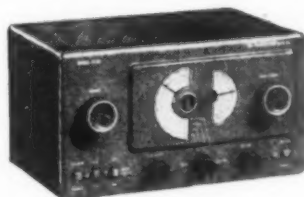
RECEIVERS

High Fidelity Miniature Tube Receiver (Hoadley)	47 Apr.
Home Built TRF Receiver (Hoskins).....	70 Jan.
Miniature All-Wave 3-Tube Receiver (Miller, W2HSV)	44 Mar.

January, 1948

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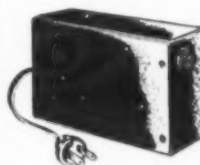


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RECORDING

The Recording and Reproduction of Sound (Part 1) (Read)..... 52 Mar.
The Recording and Reproduction of Sound (Part 2) (Read)..... 50 Apr.
The Recording and Reproduction of Sound (Part 3) (Read)..... 61 May
The Recording and Reproduction of Sound (Part 4) (Read)..... 65 June
The Recording and Reproduction of Sound (Part 5) (Read)..... 55 July
The Recording and Reproduction of Sound (Part 6) (Read)..... 57 Aug.
The Recording and Reproduction of Sound (Part 7) (Read)..... 62 Sept.
The Recording and Reproduction of Sound (Part 8) (Read)..... 51 Oct.
The Recording and Reproduction of Sound (Part 9) (Read)..... 48 Nov.
The Recording and Reproduction of Sound (Part 10) (Read)..... 48 Dec.
Timing Chart for 78.26 R.P.M. Phonograph Records..... 60 Oct.

SHORT-WAVE LISTENER

Around the Clock with Short-Wave English Newscasts..... 56 Mar.
Chart of World Time Differences... 146 Mar.
International Short-Wave (Boord)... 56 Jan.
International Short-Wave (Boord)... 64 Feb.
International Short-Wave (Boord)... 57 Mar.
International Short-Wave (Boord)... 68 Apr.
International Short-Wave (Boord)... 70 May
International Short-Wave (Boord)... 70 June
International Short-Wave (Boord)... 64 July
International Short-Wave (Boord)... 66 Aug.
International Short-Wave (Boord)... 68 Sept.
International Short-Wave (Boord)... 68 Oct.
International Short-Wave (Boord)... 67 Nov.
International Short-Wave (Boord)... 65 Dec.

TELEVISION

Build Your Own Television Receiver (Wecker & Gootée)..... 45 Aug.
Learn as You Build—Television (Liebscher)..... 39 Sept.
Networks for Television (McQuay)... 39 Nov.
Servicing Television Receivers (Wendel)..... 43 Sept.
Television Counters (Noll)..... 52 Sept.
Television Installation (Part 1) (Waye)..... 44 Sept.
Television Installation (Part 2) (Waye)..... 54 Oct.
Television Installation (Part 3) (Waye)..... 56 Nov.
Television Installation (Part 4) (Waye)..... 52 Dec.
Television Takes to the Air (McQuay)..... 57 Feb.
Transmission Line Systems for FM and Television Home Receivers (Spear)..... 44 Feb.
Reflective Optical System of Projection Television (Zworykin)..... 54 Sept.
Visual Alignment of Television Receivers (Kronenberg)..... 64 Aug.

THEORY

Output Transformer Impedance Matching (Tomer)..... 60 July

TUBES

Television Camera Tubes (Seitz)... 46 Oct.
Television Tubes By The Thousands (Butler)..... 39 Dec.
The 829-B and 832-A at Audio Frequencies (Fred)..... 60 Sept.
The Iconoscope (Kiver)..... 90 Nov.

TUNERS

A Hi-Fi Broadcast Band Tuner (Dezzetel)..... 44 Nov.

U.H.F.

Practical Microwave Communications (Freedman)..... 35 July
Ring Oscillators for U.H.F. Transmission (Gootée)..... 48 Jan.

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Fleapower Ham Portable

(Continued from page 62)

to a higher capacity. Just bear in mind that as the plates on C_{11} are unmeshed the loading is increased. It is a good idea at this time to listen in on a monitor or the main station receiver in order to hear the keying. Here again, the 20 meter band may be tricky. In extreme cases where the crystal stage is pulled out of oscillation it may be necessary to reduce the coupling condenser (C_{11}) to 100 μ fd. However, it was not found necessary with this rig as good keying was secured on 20 by using light antenna coupling, and no difficulty at all was encountered on the other bands.

With 135 volts on the plate of the amplifier tube and a current drain of 25 ma., the input power is about 3.4 watts on all bands. While this power isn't quite capable of bouncing a signal off the moon, we have bounced a couple of signals from New York to Ohio—this with an antenna slung out on the washline!

-30-

NEW ENGLAND DEALER SURVEY

PRELIMINARY reports covering the RMA-sponsored dealer survey have indicated several interesting facts regarding the status of the radio industry.

The spot check, which is being made in the New England States, although limited to 31 outlets, indicates that radio dealers in the cities surveyed are "living off their inventories" of some set models in that their sales exceed their purchases from distributors.

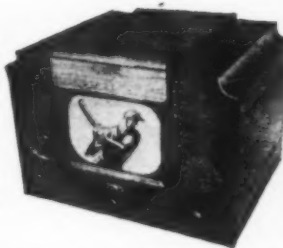
The survey also indicated a lively demand for FM-AM receivers, in excess of both dealer purchases and manufacturers' production rate, and the virtual disappearance of the straight console, without phonograph, from the market. It was also determined that these dealers reported large inventories of AM table models and that there is a steady demand for radio-phonograph consoles.

Chairman Frank Mansfield of the RMA Industry Statistics Committee has been authorized by the Board of Directors to continue and amplify the dealer survey.

-30-

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202 D 1 Focus Coil. 3.34
204 T 2 Vertical Output. 5.29
201 D 1 Deflective Yoke. 8.08
211 T 1 Horizontal Output and H.V. Transformer. 9.90
204 T 1 Horizontal Output. 13.52

Complete Line of Teletron Transformers, Focus Coils and Yokes in stock.

Chancellor Low Voltage Transformer 450 V. @ 150 ma; 6.3 V. @ 10 amps; 5 V. @ 6 amps. \$6.60

Chancellor High Voltage Transformer 2500 V. @ 4 ma; 6.3 V. @ .6 amps; 2.5 V. @ 1.75 amps. \$5.39

Amphenol 300 ohm transmission line 3c per foot. 100 ft. for \$2.75

Birnback Indoor Flexible Folded Dipole Television and FM Antenna. Complete. \$1.03

Camco Television Antennas T31, "Featherlite" Dipole. \$5.00

T32, "Featherlite" Folded Dipole. 5.88

T34, "Featherlite" Folded Dipole with reflector. 9.70

Sprague Tubular Condensers 2500 Volt Working .05, .03. .73c .002. 63c

Peaking Coils 150 uh. 12c, 250 uh. 12c

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January, 1948

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ERRATUM

Leon Wecker has pointed out two errors appearing in his article, "Build Your Own Television Receiver," which was published in the August, 1947 issue of RADIO NEWS. C₂₀ was erroneously indicated in the grid of the vertical oscillator. The correct position for this component is from the plate of the vertical oscillator to ground on the plate side of C₁₂. The second error concerned C₂₅. C₂₅ is shown at the first grid of the horizontal amplifier. It should have been placed from the plate side of C₆₄ to ground. We sincerely regret this error and trust that persons building the set will have no difficulty in rectifying the mistake.

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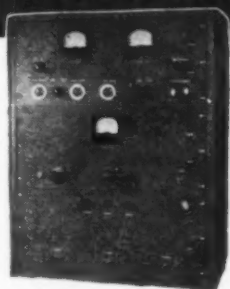
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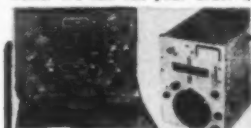
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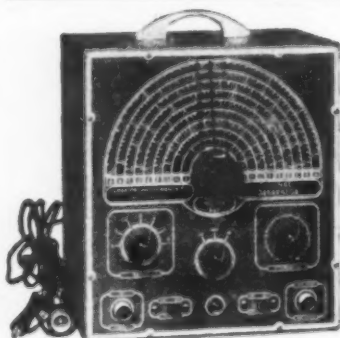
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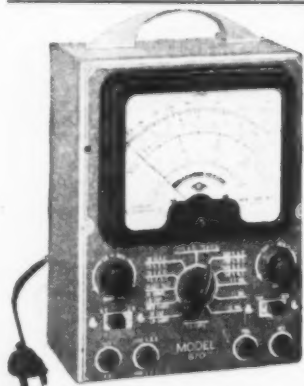
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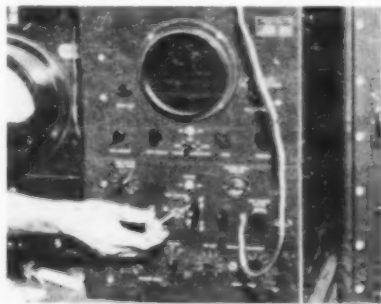
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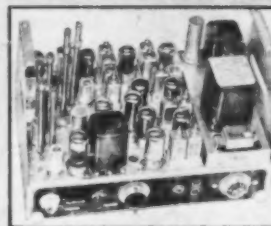
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